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EXECUTIVE SUMMARY OF THE 1990 TEXAS CLOSURE

BY

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TEXAS CLOSURE 1990

Introduction

In 1981, the Gulf of Mexico Fishery Management Plan (FMP) was implemented with the primary objective being to increase the yield of brown shrimp harvested from Texas coastal waters. Since then, various aspects of the Texas Closure management measure have been analyzed and reported on by scientists at the Southeast Fisheries Center (SEFC). This report, presented to the Gulf of Mexico Fishery Management Council in January 1991, contains the results and an overview of the effects of the 1990 Texas Closure. Due to the concerns expressed by some members of the fishing community, special emphasis has been placed on providing answers to the numerous questions relating to the 200 mile versus the 15 mile closure options.

Background

The FMP regulates fishing for brown shrimp in the Exclusive Economic Zone (EEZ) off the coast of Texas. This regulation prohibited brown shrimp fishing in the total EEZ (200 mile closure) during the periods: May 22-July 15, 1981; May 26-July 14, 1982; May 27-July 15, 1983; May 16-July 6, 1984; and May 20-July 8, 1985. In 1986, 1987 and 1988, only the portion of the EEZ from 9 to 15 miles was closed to fishing. In 1986, the area was closed from 10 May to July 2, while in both 1987 and 1988, the Texas offshore waters were closed from June 1 to July 15. In 1989, the 200 mile closure again went into effect, and the entire EEZ was closed to shrimping activities from June 1 to July 15. This year the 200 mile closure was from May 15 to July 8, 1990. State of Texas regulations, implemented in 1960, prohibited shrimp fishing in the territorial sea off Texas during these same periods, except for the white shrimp fishery from the beach to the 4 fathom line. In 1990, however, state law prohibited all shrimping activities including the 4 fathoms daytime fishery.

The management objectives of the Texas Closure regulation (as specified in the FMP) are to increase the yield of brown shrimp and eliminate the waste of the resource caused by discarding undersized shrimp caught during a period in their life cycle when they are growing rapidly. The objective of the 1960-1980 Texas territorial sea closure was to manage the fishery so that a substantial portion ($\geq$50%) of the shrimp in Gulf waters had reached 65 tails/lb or 112 mm in length by the season's opening. Thus, the temporary closure of the offshore fishery from mid-May to mid-July each year provides larger shrimp to the fishery and subsequently a higher market value.

Methods

Port agents collected statistics on the catch, effort, and fishing location of shrimp vessels operating in the Gulf of Mexico. These data provided information on the species, size and location of shrimp, as well as information on the catch rates and fishing efforts of the vessels in the fleet.

Conclusions

1. Recruitment

Recruitment of brown shrimp to Texas offshore waters in 1990 appeared to be much higher than in 1989. We predicted the 1990 annual (June 1990-May 1991) offshore harvest to be 31.5 $\pm$ 8 million pounds, which is above the average (long-term) production of 26.8 million pounds. The catch from June-August 1990 was 19.5 million pounds which projected for the year June 1990-May 1991 amounts to about 39.0 million pounds.

Weather during the latter part of 1989 and early spring of 1990 was atypical and impacted our forecasting ability with respect to harvest of brown shrimp for the 1990 season. During February through early April - the period when we expect maximum influx of brown shrimp postlarvae into the bays - numerous cold fronts pushed through Texas and western Louisiana. The low temperatures with accompanying low tides hindered immigration and probably reduced survival of postlarvae. Rainfall in 1990 was well above normal for most of Texas and Louisiana causing severe flooding of many rivers. The most notable flooding occurred in the Trinity River basin (Chambers County, Texas) with record amounts of freshwater being released from Lake Livingston into the Galveston Bay system at 50,000 cubic feet per second for an extended period of time. These high river flows and their consequent low salinities in the estuarine marsh nursery habitats pushed the small brown shrimp out into the larger bays and Gulf of Mexico prematurely.

Prospects for Louisiana brown shrimp harvests were considerably higher; our model for waters west of the Mississippi River suggested inshore and offshore catches (May 1990-April 1991) should be about 60.5 $\pm$ 11.1 million pounds for the 1990-1991 season, which is well above the 28.1 million pounds average annual yield for the area. However, this may be an over estimation since the season opened quite early this year in Zone II (May 12), and the model is based only on total pounds caught in May. Louisiana Wildlife and Fisheries scientists estimated that 1.2 million acres of prime nursery habitat for brown shrimp were available in 1990. Despite a 0.54 million acre habitat decrease since 1989, environmental conditions were apparently ideal for shrimp growth and survival. The catch from May 1990-

August 1990 was 40.8 million pounds and projects an annual yield from May 1990-April 1991 of 51.0 million pounds.

Thus, the western Gulf of Mexico should experience a combined annual brown shrimp production level of 92.0 million pounds during the 1990-1991 season which is nearly double the 55.0 million pounds average for the area.

2. Fishing Trends

In 1990, the total Louisiana May-August catch was 40.8 million pounds compared to 20.4 million pounds in Texas. Recruitment levels were different between the two areas. The Texas offshore brown shrimp catch in July and August 1990 was 19.5 million pounds compared to 16.3 in 1989, 12.5 in 1988, 14.2 in 1987, 10.7 in 1986, 14.0 in 1985, 15.3 in 1984, 9.8 million pounds in 1983, 13 million pounds in 1982, and 25 million pounds in 1981 (Table 1).

Fishing effort was moderately high off both Louisiana and Texas in 1990 (Table 1).

The average catch per unit effort (CPUE) off Texas for July-August 1990 period was 1,188 pounds/day compared to 1,028 pounds/day in 1989, 684 pounds/day in 1988, 789 pounds/day in 1987, 856 pounds/day in 1986, 918 pounds/day in 1985, 819 pounds/day in 1984, 962 pounds/day in 1983, 922 pounds/day in 1982, and 1,895 pounds/day in 1981. Off Louisiana the average CPUE for the July-August 1989 period was 484 pounds/day, whereas the July-August 1988 period average CPUE was 652 pounds/day. Thus, during the July-August 1990 and 1989 periods, the CPUE off Texas was at least 1.5-2.0 times greater than off Louisiana (Table 1). This is similar to most other closure years.

The July size composition of the 1989 offshore brown shrimp catch in Texas waters was similar to other closure years with the 31-40 size category predominant.

The Louisiana inshore brown shrimp fishery produced 15.9 million pounds in 1990 compared with 11.3 and 14.0 million pounds in 1989 and 1988, respectively.

The Texas inshore fisheries accounted for approximately 7.3 million pounds of brown shrimp in 1990, 6.1 million pounds in 1989, 6.9 million pounds in 1988, 7.6 million pounds in 1987, 5.1 million pounds in 1986, 5.4 million pounds in 1985, and 7.1 million pounds in 1984. The inshore catch in 1990 was dominated by shrimp of 116 count or greater. Overall, small shrimp were prevalent throughout the bays in May and June, resulting in small shrimp available to the Texas offshore fishery in June, but larger count shrimp were available in July and August.

3. 1990 SEAMAP Sampling

Dr. Scott Nichols has shown that 1990 fishery independent survey results are similar to other closure years. He stated that an increase in yield in pounds due to the closure off Texas was indicated for 1990, as has been the case for every year since 1981 (Appendix A).

4. Questions Related to 200 vs 15 Mile Texas Closure

a) Is the 15 mile closure enforceable?

The Chief of the National Marine Fisheries Service's Enforcement Office, Suzanne Montero, clearly states that a 15 mile closure cannot be effectively patrolled and will result in a "severe number of violations." Ms. Montero suggests that enforcement efforts are complicated by the fact that shrimpers trawl "right on the line" during a 15 mile closure. Vessels equipped with radar can rapidly detect approaching Coast Guard cutters and quickly terminate illegal fishing activities. In conclusion, Ms. Montero states that "if the goal is to ensure that no trawling occurs while the brown shrimp are rapidly growing to market size then the only rational decision is to continue with a 200 mile closure."

The Commander for the Coast Guard group for Corpus Christi identifies the following problems with the enforcement of a 15 mile closure: 1) accurate fixing of positions; 2) strong incentives to violate; 3) inadequate enforcement resources; 4) loss of credibility for the Coast Guard; 5) violators can easily evade enforcement action. He concludes that the most effective evasion technique is to simply overwhelm enforcement resources with a large number of violators. The Commander further states that the vast majority of violators suffer no ill-effects from violating the closures and that the chance of any single vessel being stopped and having its catch seized is quite small. He concludes that the substantial financial rewards involved in taking this chance are apparently worthwhile. He points out that even if a vessel has a catch seized on a particular night, the loss can be made up on subsequent nights with little chance of additional enforcement action.

Ms. Montero's memorandum dated 15 October 1990 and the Commander's (Coast Guard Group Corpus Christi) memorandum dated 19 August 1988 are presented in Appendix B and C, respectively. In short, both the U. S. Coast Guard and the National Marine Fisheries Service's enforcement division conclude that enforcement of a 15 mile closure is not feasible.

b) Does a 200 mile closure give the importers a market advantage?

Gulfwide brown shrimp production is substantial during the closed and reopen period. Shrimp production from 1981 through 1989 during the closed period averaged well over 30 million pounds and over 40 million pounds in 1981 and 1986. Production during the reopen period (i.e. opening day through 31 July) varied from 9.8 million pounds in 1988 to 16.5 million pounds in 1981. Hence, the contention that there is a void in production during the closed and reopen period is not substantiated. On the contrary, well over 30% of the Gulf of Mexico annual production occurs from the time of the closure until the end of July (Figures 1 and 2). Based on these data, we conclude that importers do not have an advantage over domestic producers during the closed and reopen period.

c) Is there a paucity of different size counts before and after the Texas Closure?

In reviewing data from 1982-1989 on size counts and production as shown in Figures 3a and 3b, it is apparent that there is an ample abundance of the smaller size counts available during both the closed and reopened period. Although, 67 count and larger category shrimp are most prevalent, there are substantial quantities of 51-67s and 41-50s available during both the closed and reopened period. There appears to be a paucity of the larger sizes, rather than the opposite as claimed by some proponents of the 15 mile closure.

d) Do a majority of shrimp migrate out of Texas waters during the closed period?

The question of whether brown shrimp emigrating from Texas estuaries are lost either to Louisiana or Mexico during the Texas Closure has been addressed by several research projects and publications since 1978. Although not specifically designed to address the Texas-Louisiana border (Gazey et al. 1982), offshore releases of brown shrimp in western Louisiana waters during June and August 1978 resulted in both easterly and westerly (into Texas) movement. In addition, mark-recapture studies conducted during May-August 1981 near Big Hill, Texas, and West Hackberry, Louisiana, indicated both east and west movement of brown shrimp, with larger numbers of recaptures made in Texas waters. These results indicated that "loss" of Texas brown shrimp to Louisiana during the closed season were minimal and shrimp movements actually may have resulted in a

"gain" from Louisiana estuaries.

Movement across the Texas - Tamaulipas (Mexico) border during the Texas Closure was specifically addressed. Theoretical models, based on shrimp movement speed and fishing mortality, indicated that brown shrimp moving south from Aransas Pass would stand little chance of reaching the border during the closed season (Klima et al. 1987). Shrimp moving through Brazos-Santiago Pass could quickly move across the border (only 10 miles south), but any "losses" during the closure could be offset by "gains" from shrimp moving northward from the Mexican Laguna Madre. The actual movements around the border were addressed by a joint US-Mexico mark-recapture experiment during May-August 1986 (Sheridan et al. 1989). No net directional movement was detected for brown shrimp on either side of the border, therefore no net "loss" of brown shrimp during the closure would be felt by the fishermen. However, a net northward movement of pink shrimp from Tamaulipas was indicated, possibly resulting in a "gain" of fishable biomass for Texas shrimpers.

e) Is valuable fishing time lost from May through October because of bad weather?

We have reviewed the weather information from the Corpus Christi and Galveston weather bureaus and have documented the number of tropical storms and hurricanes occurring from 1985 through 1990 (Table 2). In 1990, there were no tropical disturbances. In 1989, one tropical storm and two minimal hurricanes occurred. Two hurricanes each occurred in 1988 and 1985; the 1987 and 1986 seasons had one tropical disturbance each. Further, we have looked at the possible number of days lost to shrimping due to winds $\geq$22 knots from May through October and January through December (Figure 4). For the Galveston area, there were 10 days or less of winds $\geq$22 knots from May through October in most years, whereas, in 1989 there were about 16 days. For the Corpus Christi area there were generally less than 20 days that had winds $\geq$22 knots velocity from May through October. Coupled with information from NMFS port agents that list the number of days in which vessels moved into or out of port, we conclude that there were no days that vessels did not either enter or leave port in 1988-1989 from July through October (Table 3). The contention that there were a few days lost due to bad weather is valid, but not 45 to 60 days during this period of time as claimed by some. It is quite obvious during the rest of the year that winds are much more vigorous. For the Corpus Christi area over 50 days were recorded when wind velocities were over 22 knots. It does not appear that bad weather has much of an impact on lost fishing time with the exception of the odd hurricanes from May-October time frame.

f) Does the Texas Closure have an impact on the market price of shrimp landed in Texas?

John Ward summarized his concepts as a fishery economist concerning the price of shrimp related to the Texas Closure as follows:

"The Texas Closure regulation has been alleged to have significant impacts on the price of shrimp landed in Texas. Domestic landings in the Gulf of Mexico have ranged from a low of 133 million pounds live weight in 1961 to a high of 304 million pounds in 1986 and have averaged 223 million pounds since 1950 and 234 million pounds since 1960. This range in annual landings is generally attributed to environmental variability (Garcia, 1988). The increase in average landings may be due to increased fishing effort on marginal fishing grounds as fleet size has grown with improving market conditions (Ward, 1989). The average exvessel price of shrimp has grown substantially in this 39 year period increasing from $0.35 to $2.92 per pound on a heads-off basis in spite of an increase in imports from 44 million pounds heads-off in 1950 to 563 million pounds in 1989; nearly doubling since 1980. Total domestic landings as a share of total market supply have declined from 67% in 1950 to 26% in 1989. Even if the Texas Closure were to increase landings by approximately 10 million pounds, this would result in only a 1.2% increase in total market supply. The price flexibilities estimated for three size classes of shrimp (Poffenberger, 1987) indicate that large variations in landings have trivial impacts on market prices. Given the relatively small percentage change of a 10 million pound increase in total market supplies of shrimp, it is doubtful that the Texas Closure has had any discernable impacts on exvessel prices."

There is also the contention that the average price of shrimp was $.90 more during the 15 mile closures than the 200 mile closure. As an example, the average price of brown shrimp in July 1988 was $3.29/lb, whereas, in 1989 it was $3.17/lb. There were some differences in the prices for the larger size shrimp; mainly sizes from 15-30 count were slightly higher in 1988 than 1989, but for the 31-40s and larger size categories the price was virtually the same or slightly higher in 1989 (Figure 5).

g) Is valuable fishing time lost during June?

The Texas Closure is designed to protect emigrating subadult shrimp that are moving offshore during the months of June and early July. There are virtually no large brown shrimp available within 20 miles of the coastline during this time

and the only shrimp available are emigrating subadult brown shrimp and adult white shrimp along the upper Texas coast. During the 15-mile closure years, approximately one million pounds of shrimp were landed during June in 1986 and 1987 and about 700,000 lbs in 1988 (Figure 6a). The catch was basically small shrimp (67 count or larger, Figure 6b). Specifically, in 1987 almost 600,000 lbs of 67 count or larger size categories were caught inside 15 miles. The major portion of the brown shrimp catch was produced inside 15 miles during the 15-mile closure years (Figure 6c). Therefore, the contention that fishing time was lost is true if you desire to fish for small shrimp with low market value. It is quite clear that by protecting shrimp emigrating during this critical time that larger and more valuable shrimp are available to the fishery in mid-July.

h) At the opening of the season in mid-July, are larger concentrations of shrimp always off one part of the Texas coast?

In reviewing these data from 1986 through 1989, we looked at catches of brown shrimp during the reopened period. The concentrations of catches are clearly within given depth zones. Most commonly, largest concentrations of catches are found from 6-25 fathoms, with the peak at the 10-15 fathom depth contour; however, this does vary between years (Figure 7 a,b,c,d and Figure 8). In a geographical sense, the predominant catch areas during the reopen period are statistical areas 18 and 19, with 19 greatest. Historically, statistical area 19 produces the largest catches, with 18 close behind; lower catches are reported from areas 20 and 21. In analyzing these data it does not appear that there is a specific geographical advantage with a 200 mile closure. Largest yield occurs in waters off the center part of the Texas coast during both closure options. However, all areas off the Texas coast do contribute significantly to the total production during the reopen period. It is also quite clear that the largest catches of shrimp can be expected from the 10-20 fathom depth zones in each statistical area.

i) What impact did the prohibition of shrimp trawling during the 1990 closure have on the July white shrimp fishery?

The July 1990 white shrimp fishery appeared to be very productive off the Texas coast with over 82% of the total catch comprised of under 15 count shrimp. From 1982, when daytime fishing was permitted inside 4 fathoms during the Texas Closure, the percentage of white shrimp under 15 count ranged up to a maximum level of approximately 60%, with an average of only 36% (Figure 9). With the prohibition of shrimp trawling, it appears that the available shrimp in

June were allowed to grow to a larger and much more profitable size. Further, the CPUE was over 1150 lbs/day in 1990, whereas, in previous years the CPUE on the total white shrimp stock in July ranged from 182-536 lbs/day. Total white shrimp catch ranged from a low of 197 thousand pounds in 1988 to 599 thousand pounds in 1983, whereas in 1990, the total white shrimp catch in July was 381 thousand pounds; just about equal to the average July catch of 387 thousand pounds for the 1982-1989 period.

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Figure 8. Offshore brown shrimp catch, fishing effort, and CPUE from statistical subareas 13-21 from May through August 1990.

Figure 9. Percent of white shrimp catch for July from statistical areas 18-21, 1982-1989 and 1990.

The 1990 Texas Closure - Results of SEAMAP Sampling

Scott Nichols
NMFS Mississippi Laboratories

Potential gain from the 1990 Texas Closure was again calculated based on the brown shrimp size composition observed in June/July SEAMAP trawling survey. The same methods used in last year's report were repeated. Last year, the Council indicated that its evaluation of the Texas Closure was complete. NMFS continues to monitor the Texas Closure at a lower level, to alert the Council to any changes that might warrant reopening discussion of the manangement measure. The SEAMAP sampling will show quickly if any changes in biological potential for gain from the Texas Closure occur over the years.

The 1990 size composition of brown shrimp in the EEZ off Texas was estimated from data collected aboard the NOAA Research Vessel OREGON II, as part of the standard summer SEAMAP survey (Fig. 1). Yield per recruit calculations evaluate the trade-off between growth of individual shrimp and losses due to natural mortality in the closed area, producing estimates of change in yield due to closure. Changes in yield are calculated for an extended range of fishing mortality rates (F's), for two values of natural mortality rate (M=0.15 and 0.28 per month). As in previous analyses, the two M values were chosen to bracket the range of values expected in the closed areas. To compare the biological potential in 1990 with other years, calculations were based on a hypothetical 200 mile, 45 day (June 1 to July 15) closure for all years since 1981. The estimate of percent change due to closure vs F is shown in Fig 2. F=1.0, believed to approximate the F off Texas upon opening, is taken as the point of comparison among years (Fig. 3).

An increase in yield in pounds due to closure was indicated for 1990, as has been the case for every year since 1981. The year to year variation has been unexpectedly small. There has been a downward trend in potential gain since a 1987 peak, but closure still appears effective. Continued increase in inshore fishing effort in Texas could eventually render the closure ineffective, so monitoring will continue.

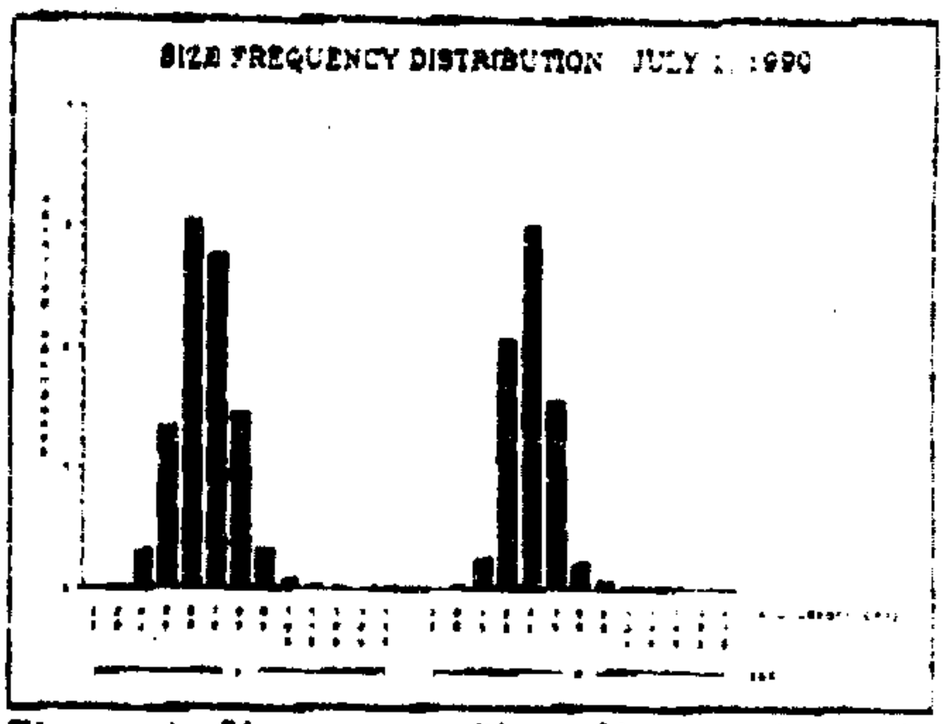


Figure 1. Size composition of brown shrimp in the Texas EEZ.

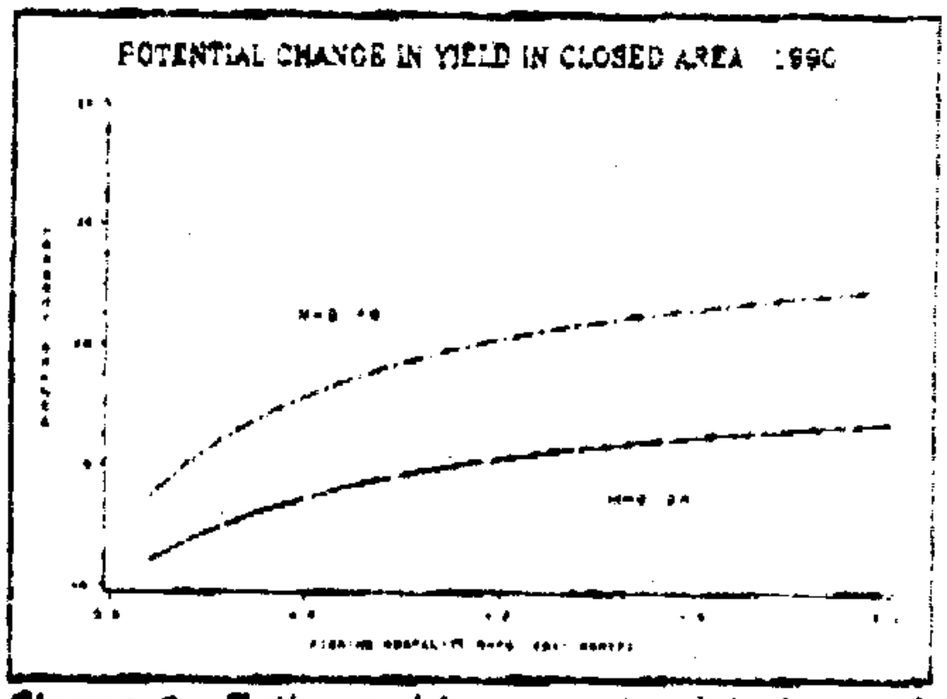


Figure 2. Estimated increase in yield from 45 day closure.

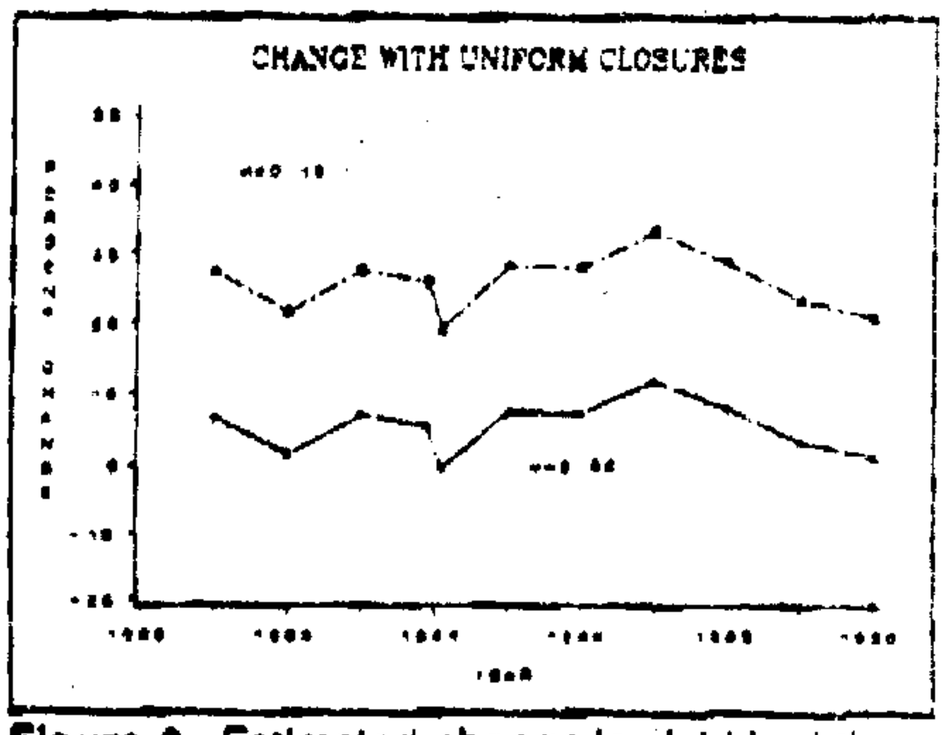


Figure 3. Estimated change in yield had there been identical 45 day closures and F=1.0 per month.

APPENDIX B

October 15, 1990

MEMORANDUM FOR: F/SEC6 - Dr. Edward F. Klima

FROM: F/EN22 - Suzanne Montero

SUBJECT: Enforcement Concerns Regarding the Proposed Fifteen Mile Texas Closure in 1991

National Marine Fisheries Service, Office of Enforcement, and U. S. Coast Guard District 8, remain opposed to a fifteen mile Texas closure in 1991. The reasons for this opposition have not changed since the Counsel voted in 1989 for a 200 mile closure. These reasons are detailed as follows:

- A fifteen mile Texas closure is actually a closure of a six mile wide strip of federal water, and a nine mile closure of state waters for the entire length of the Texas coastline. Documentation of violators within this six mile federal strip has always been difficult because the government must prove that a shrimper was actively engaged in shrimp trawling within this strip in order to establish a violation. It is mandatory that the government prove through use of loran navigation that a particular vessel was at a particular time trawling within the six mile closed strip. Loran navigation remains an imperfect technology. It is rare to establish a case within one quarter mile of either side of the six mile closed strip. In effect, this reduces the width of the closed strip to five and a half miles. During 1988, which was the last year of a fifteen mile closure, we began to notice a trend by some shrimp vessel captains to trawl right on the boundary between federal and state waters at nine miles. This poaching activity forced Coast Guard patrols to attempt to make the extremely difficult case of trawling very close to federal jurisdiction. Coast Guard patrols had to be significantly increased during the last few weeks of the closure because of the threat of civil disobedience between legal and illegal fishermen. Some cases failed due to the inability to absolutely prove the offender was trawling in federal waters.

- Because shrimpers can lawfully trawl at fifteen miles offshore along the entire Texas coastline, the opportunity to poach within the six mile closed area exists at all times. The offending shrimp vessel only need to possess a radar which is able to accurately paint targets rapidly approaching their position. In most cases, we have found since 1986 that alert shrimp vessel captains poaching within

the six mile closed area can usually exit the area before being stopped by a rapidly approaching Coast Guard cutter. If a shrimper should be unlucky enough to be stopped, the rest of the shrimpers in the area are likely to realize that they will be free of harassment by the Coast Guard while the detained shrimper is taken into port.

- Air patrols by Coast Guard helicopters have had limited success in actually documenting violations from the air. It is necessary that the helicopters approach the offending shrimp trawlers very closely in order to provide that the vessel was actually engaged in trawling at a particular time within the closed area. Possible navigation errors from the aircraft are further compounded by the inability to photographically document the violation during the hours of darkness from the aircraft. Very often in the past, shrimp vessels have succeeded in merely covering their name and identifying documentation number and fleeing into the night before they could be intercepted by a surface Coast Guard unit.

- The above factors dictate that any success in patrolling a fifteen mile closure requires extensive use of Coast Guard surface and air patrols at the exclusion of other duties. By contrast, a 200 mile closure is easily patrolled in both day light and night time. Vessels sighted during day patrols are immediately approached and an inquiry is made as to why they are out there at all since the entire EEZ is closed to shrimping activity.

- In 1987 and 1988, extremely detailed and concerted plans were made to attempt to enforce the fifteen mile closures that were in effect during those two years. In 1987, thirty-nine cases were documented; in 1988 forty cases were documented. In both of those years, literally dozens of complaints were received daily during the last three weeks of each closure alleging poaching activity within the closed six mile strip. The only factor that limited the number of cases documented were the number of patrol units available on any particular night. By contrast, in 1989 and 1990, a total of fourteen cases for the two years were documented alleging unlawful shrimp trawling within the closed area and several of these cases only involved trawling with tri-nets.

- The threat of catch seizures has not proved to be effective in deterring vessels form violating the fifteen mile closures. The offending shrimp vessel captain merely gets underway again as soon as possible to poach in a more aggressive fashion in order to make up for lost revenues due to the seizure of the previous catch. This pattern of activity is not observed during 200 mile closures.

In summary, we are certain that a fifteen mile closure cannot be effectively patrolled and will result in a severe number of violations. The most annoying factor of this condition is that it is very possible for the clever poacher with an alert radar watch to avoid detection altogether. None of these conditions exists in a 200 mile closure. If the goal is to ensure that no trawling occurs while the brown shrimp are rapidly growing to market size, then the only rational decision is to continue with the 200 mile closure.

APPENDIX C

19 Aug 88

FROM: Commander, Coast Guard Group Corpus Christi

TO: Commander, Eighth Coast Guard District (ole)

Subj: CRITIQUE OF 1988 TEXAS SHRIMP CLOSURE (TSC) ENFORCEMENT

Ref: (a) CCGD8 OPORDER 08-88' Texas Closure Enforcement
(b) CCGD8NOTE 16214; LORAN Accuracy in Fisheries Cases

1. This year's Shrimp closure was marked by overwhelming numbers of violations, antagonism and threats between violating and non-violating shrimpers and complaints to the Coast Guard about lack of enforcement. In addition, Lacey Act violations appear to be commonplace, with most fishing activity taking place in Mexican waters within 12 NM of land thus preventing pursuit and documentation by the Coast Guard and NMFS. During the closure, a resurgence of extremely blatant Mexican shark boat activity in the U. S. EEZ began, with violators reported up to 24 miles north of the border. By the end of the Closure, 40 TSC violations involving 26 seizures had been documented. The majority were found in the Port O'Connor area. A chronology of significant events is included as enclosure (1).

2. Problem areas that arose in the enforcement of the closure include:

a. Accurate fixing of position: It is difficult for both the Coast Guard and shrimpers to fix positions with the degree of accuracy required by such a narrow closure area (9-15 NM from shore). The major problem with this for the Coast Guard is being able to legally prove violations which are often found quite close to the 15 NM line. LORAN accuracy has been successfully disputed in court, resulting in the somewhat cumbersome requirements of reference (b). For the fisherman, successful fishing during the Closure requires trawling as close to the 15 NM line as possible. This requires very careful navigation, accurate equipment, and constant attention to position on the part of the master. All three of these requirements are often lacking on fishing vessels. Undoubtedly, many violations are unintentional and the results of simple carelessness or lack of navigational ability by fishing vessel crews.

b. Strong Incentive to Violate: Shrimp catches can be significantly increased by fishing as close to shore as possible. This is obvious from the fact that legal shrimpers are always found right on the 15 NM line. Conversations with shrimpers have also verified this fact. In the absence of any visible

enforcement deterrent, there is strong, financial incentive to fish inside of the Closure Zone. Competition with other shrimpers increases the temptation to fish inside the zone, particularly when vessels already fishing in violation are obtaining substantial catches.

c. Inadequate Enforcement Resources: Coast Guard and NMFS resources devoted to enforcement are inadequate to handle the number of violations occurring. Each successful enforcement action requires a tremendous investment in man hours. When time spent underway to the scene, sighting, boarding, escorting to port, supervising the off-load and completing the large amount of required paperwork is all added up, the total is substantial. When as many as 85 shrimpers are sighted in violation at one time, there is simply no way a couple of WPB's and small boat stations can begin to cope, particularly when a typical single enforcement action can take 6-8 hours. The WPB's are by far the most capable platform available. They have the endurance, range, and ability to handle foul weather to enable them to do the job. The availability of these vessels has been limited by scheduled maintenance periods both this year and in previous closures. The 41' UTB's and 44' MLB's have performed ably, but have limited range and endurance. Aircraft usefulness is limited due to the fact that almost all fishing occurs at night. Fixed wing aircraft can generally tell if fishing is occurring by observing the wakes of vessels which are illuminated by the strong deck lights used on most shrimp boats. Positive identification or even absolute determination of fishing activity is difficult by fixed winged aircraft. Helicopters can hover and illuminate vessels to positively determine identification and fishing activity, but night approaches to hover over water are taxing on the pilots and entail an increased level of risk. The Air Station night vision devices are rendered useless by the glare of shipboard lights. Even very dim running lights are enough to obscure names and other identifying characteristics on vessels.

d. Loss of Credibility for the Coast Guard: By mounting a minimal enforcement effort, the Coast Guard has lost prestige in the eyes of legitimate fishermen who see themselves being taken advantage of by the violators. Violators see no credible deterrent and thus are encouraged to fish illegally. The more violators there are, the less chance any individual fishermen will suffer legal repercussions. By the time we started enforcement in earnest this year, the number of violations were beyond our ability to seriously interdict. This cast the Coast Guard in the worst possible light. We were seen by the legitimate fishermen as unable to protect his resource as required by law, and by the violator as little or no threat to his illegal activity.

e. Violators can easily evade enforcement action: Several successful evasion tactics were encountered this year. The

traditional obscuring of identifying marks was seen on the three vessels believed to be from Louisiana which had painted over the documentation numbers. A boat found by Station Sabine had painted over the numbers, name, and homeport! In the Port Isabel area, boats can easily flee into Mexican territorial waters, thus preventing pursuit. The POINT NOWELL reported on several occasions monitoring radio communications between shrimpers indicating that Coast Guard resources are constantly tracked and reported throughout the fleet. In one instance, up to 120 radar contacts believed to be shrimpers, moved out of the Closure area on the approach of the cutter.

Though likely unintentional, probably the most effective evasion technique is simply overwhelming enforcement resources with large numbers of violators. While we may seize the catches of several vessels, the vast majority suffer no ill effects from violating the Closure. The chances of any single vessel being stopped and having its catch seized are quite small. In view of the substantial financial reward involved, this is a chance apparently well worth taking. Even if a vessel has a catch seized on a particular night, the loss can be made up on subsequent nights with little chance of additional enforcement action.

Table 1. Commercial catch statistics for the Gulf of Mexico brown shrimp fishery.

July-August brown shrimp landings (millions of lbs), fishing effort (1,000 days) and CPUE (lbs per day).

	1981	1982	1983	1984	1985	1986	1987	1988	1989	1990
Texas Offshore										
Catch	25.0	13.0	9.8	15.3	14.0	10.7	14.2	12.5	16.3	19.5
Effort	14.8	15.7	10.3	18.6	15.2	12.5	18.1	18.2	15.9	16.6
CPUE	1,895	922	962	819	918	856	789	684	1,028	1,188
Louisiana Offshore										
Catch	10.5	5.1	4.9	6.6	6.1	9.6	9.3	8.3	7.5	6.0
Effort	11.9	9.8	11.2	11.2	9.7	11.8	15.8	15.4	11.5	12.3
CPUE	863	524	439	587	625	813	589	538	652	484

Table 2. Tropical storms and hurricanes affecting the Texas coast, 1985-1990.

1985	
Hurricane Danny	August 13-16
Hurricane Juan	October 25- November 1
1986	
Hurricane Bonnie	June 23-26
1987	
Unnamed Tropical Storm	August 9-17
1988	
Hurricane Florence	September 7-11
Hurricane Gilbert	September 8-19
1989	
Tropical Storm Allison	June 24-27
Hurricane Chantal	July 30-August 3
Hurricane Jerry	October 12-16
1990	
None	

Table 3. Number of days in the month when vessels either entered or left port in 1988 and 1989.

1988	Upper Texas Coast		Lower Texas Coast	
	Activity	No Activity	Activity	No Activity
J	31	0	31	0
F	27	2	29	0
M	30	1	30	1
A	28	2	30	0
M	30	1	31	0
J	30	0	30	0
J	31	0	31	0
A	31	0	31	0
S	30	0	30	0
O	31	0	31	0
N	30	0	30	0
D	22	9	31	0

1989	Upper Texas Coast		Lower Texas Coast	
	Activity	No Activity	Activity	No Activity
J	29	2	31	0
F	25	3	27	1
M	27	4	31	0
A	28	2	30	0
M	31	0	31	0
J	29	1	30	0
J	31	0	31	0
A	31	0	31	0
S	30	0	30	0
O	31	0	31	0
N	29	1	30	0
D	26	5	28	3

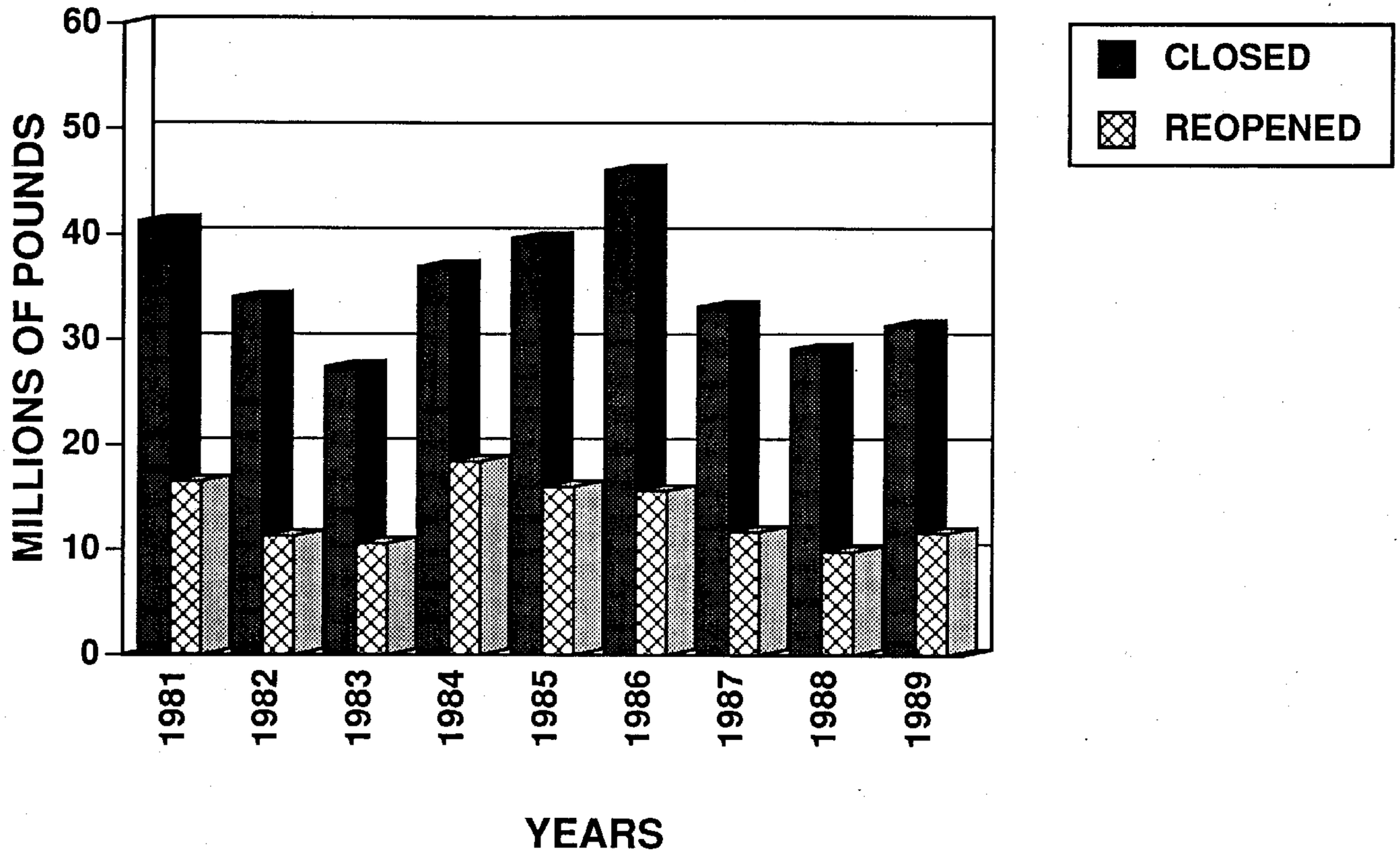


Figure 1. Brown shrimp harvest (millions of pounds) from the Gulf of Mexico (inshore included) from 1981 through 1989 during the closed and reopen period.

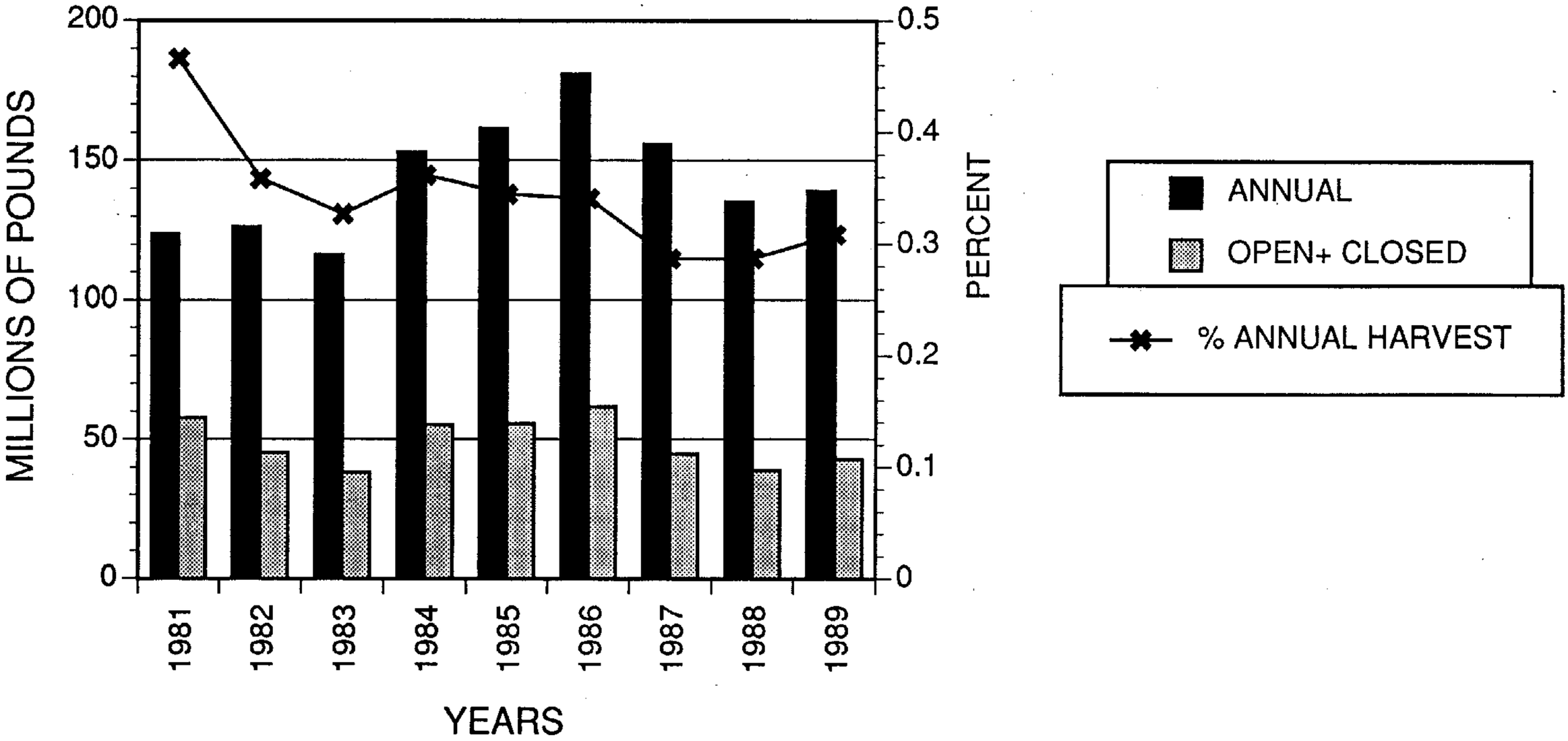


Figure 2. Total annual harvest from the Gulf of Mexico (all species combined); harvest during the closed and reopen period to the end of July; and percent of annual harvest from 1981 through 1989.

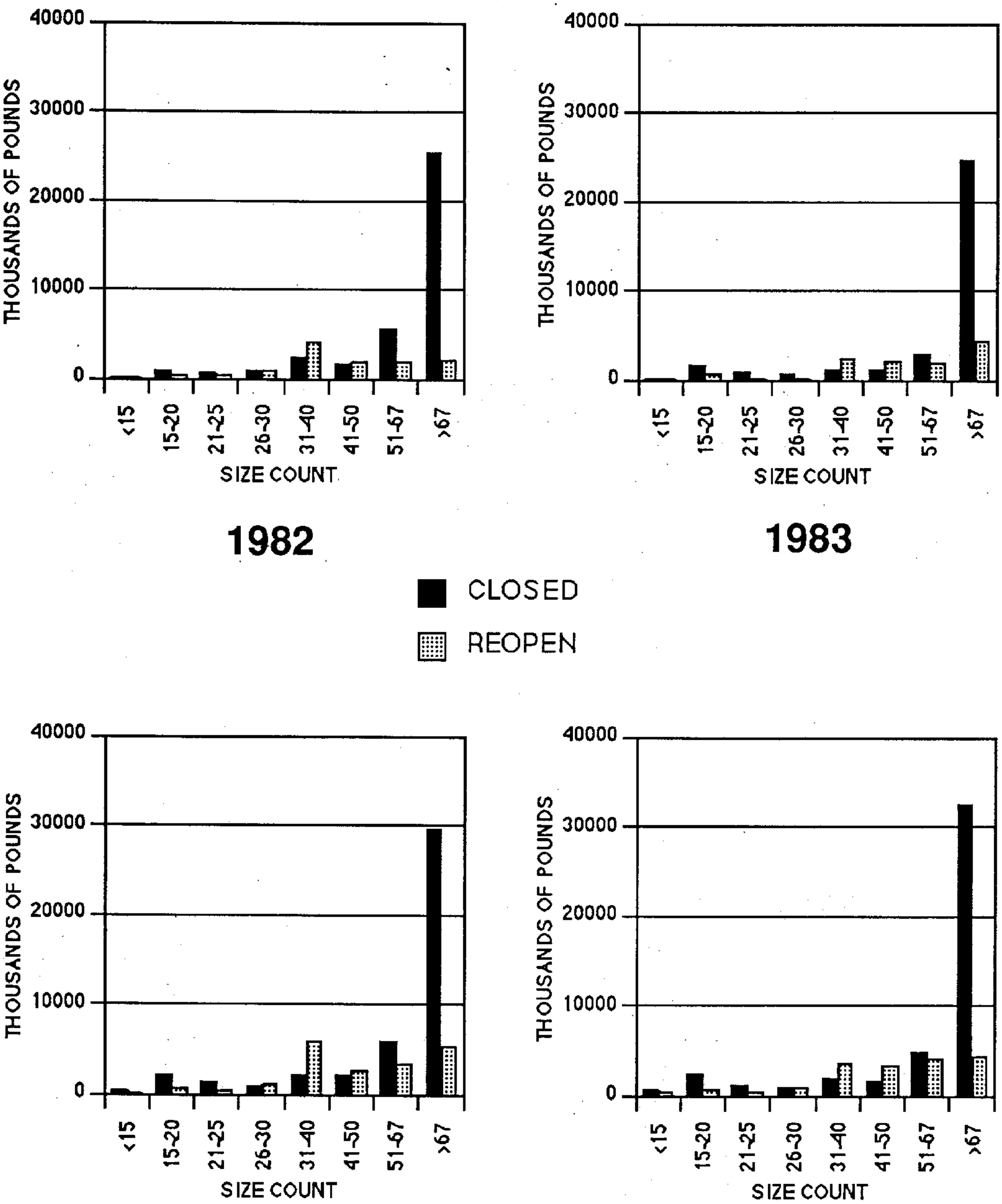


Figure 3a. Pounds and size count (all species combined) harvested from the Gulf of Mexico, 1982-1985.

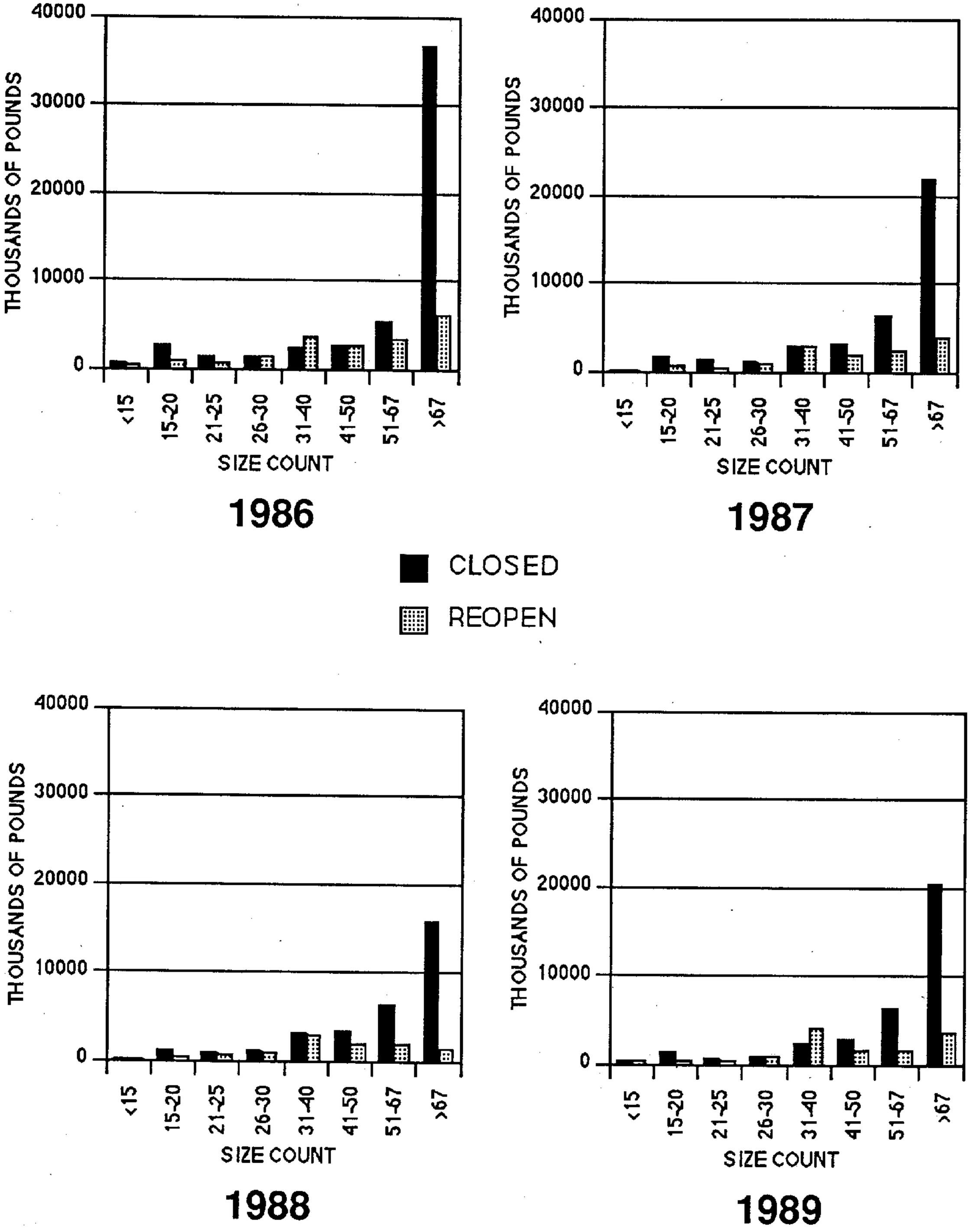


Figure 3b. Pounds and size count (all species combined) harvested from the Gulf of Mexico, 1986-1989.

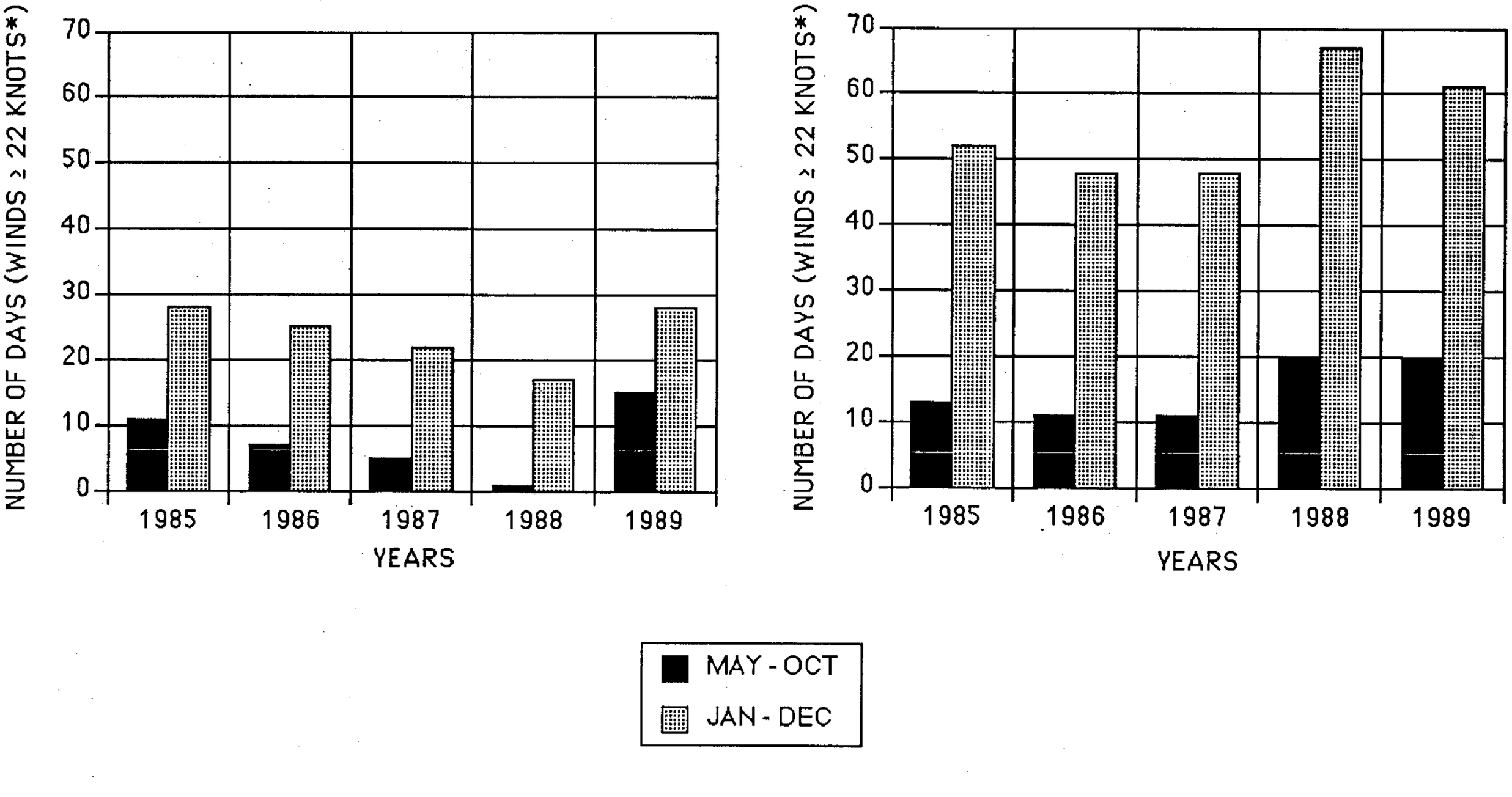


Figure 4. Possible number of days lost to shrimping due to winds equal to or greater than 22 knots (25mph) for Galveston and Corpus Christi, Texas (1985-1989). *Wind speed recorded as fastest mile (i.e. highest recorded speed for which a mile of wind passes station). Data obtained from the National Weather Service.

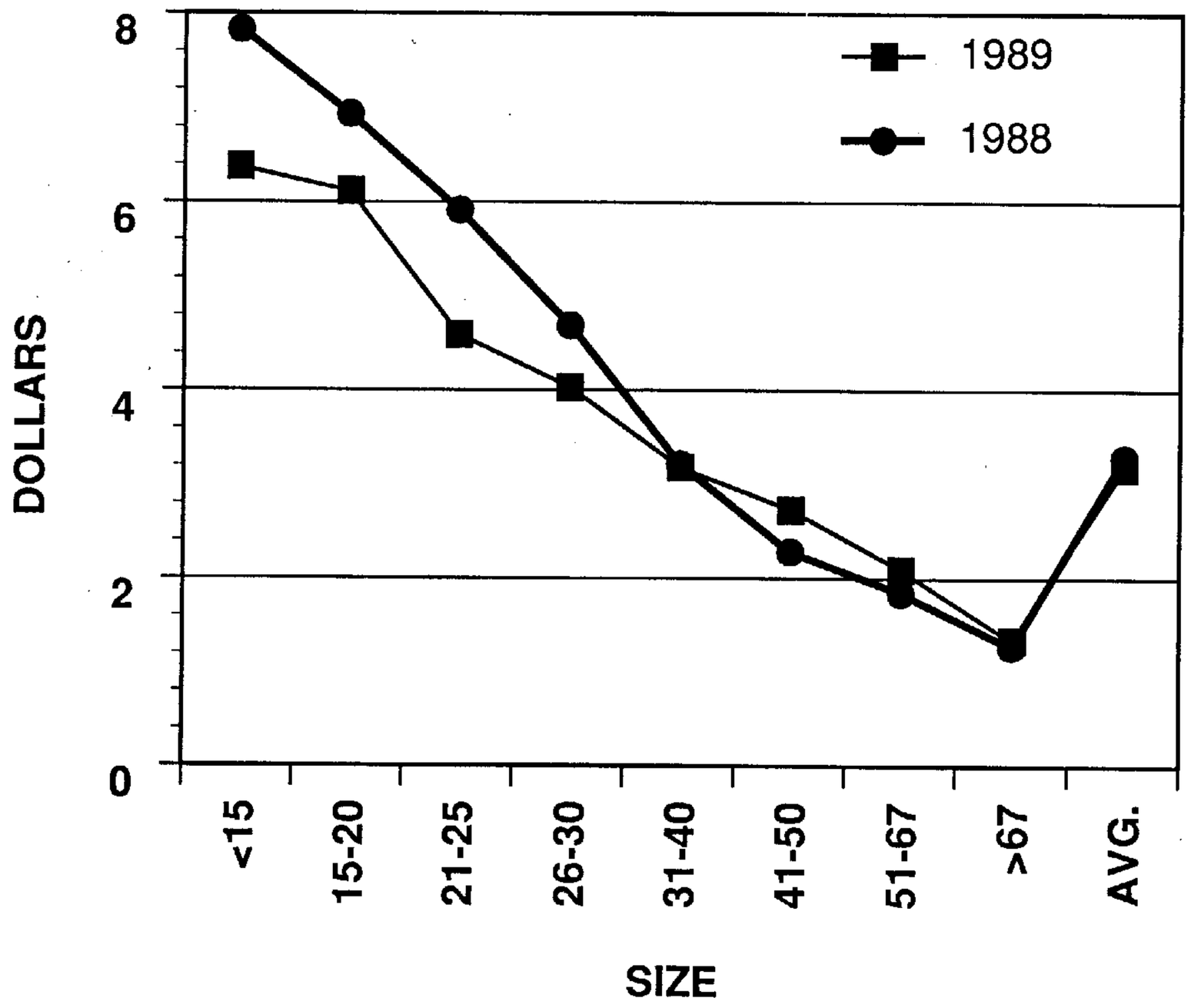


Figure 5. Price per pound (tails) by size category in July 1988 and 1989 for brown shrimp.

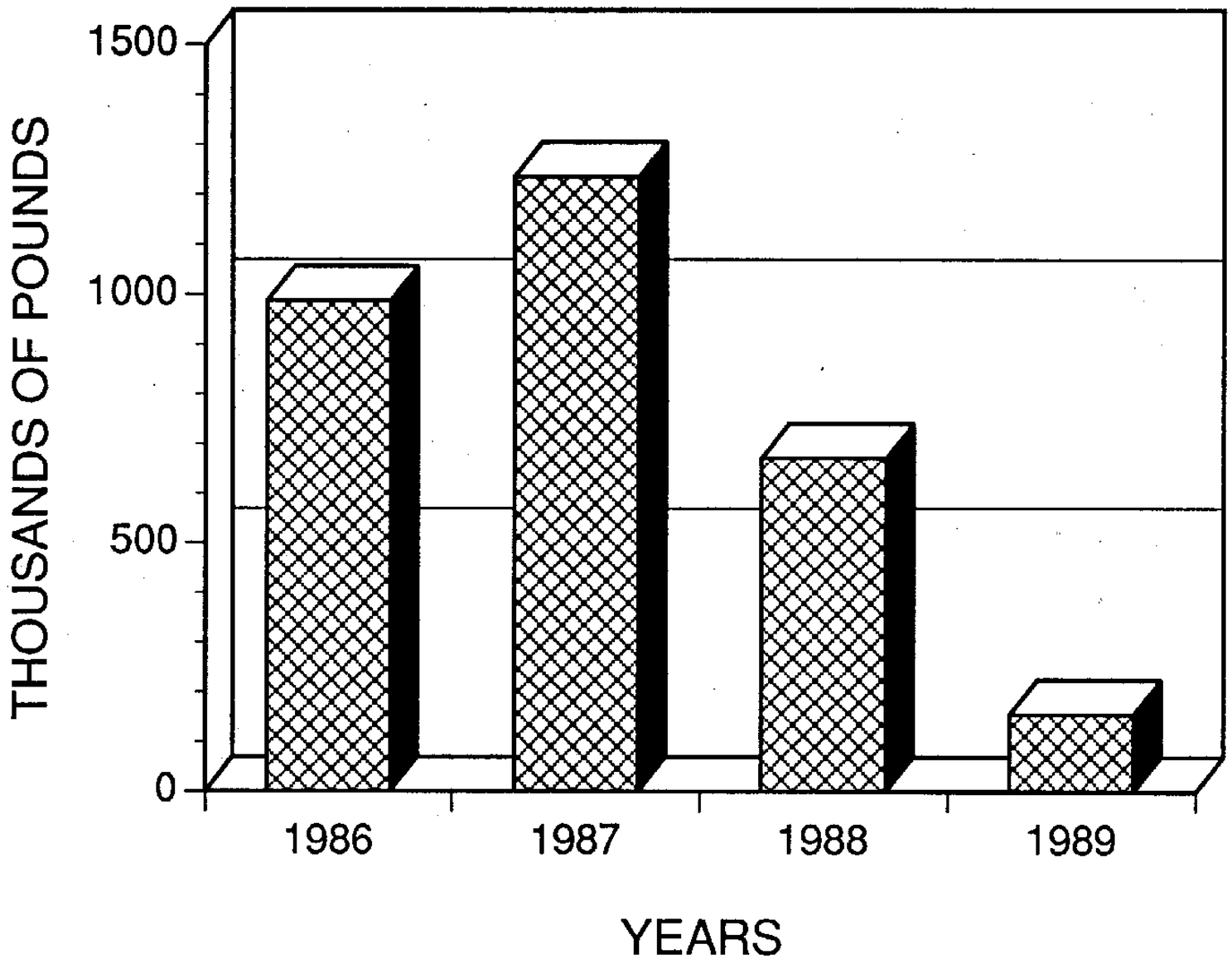
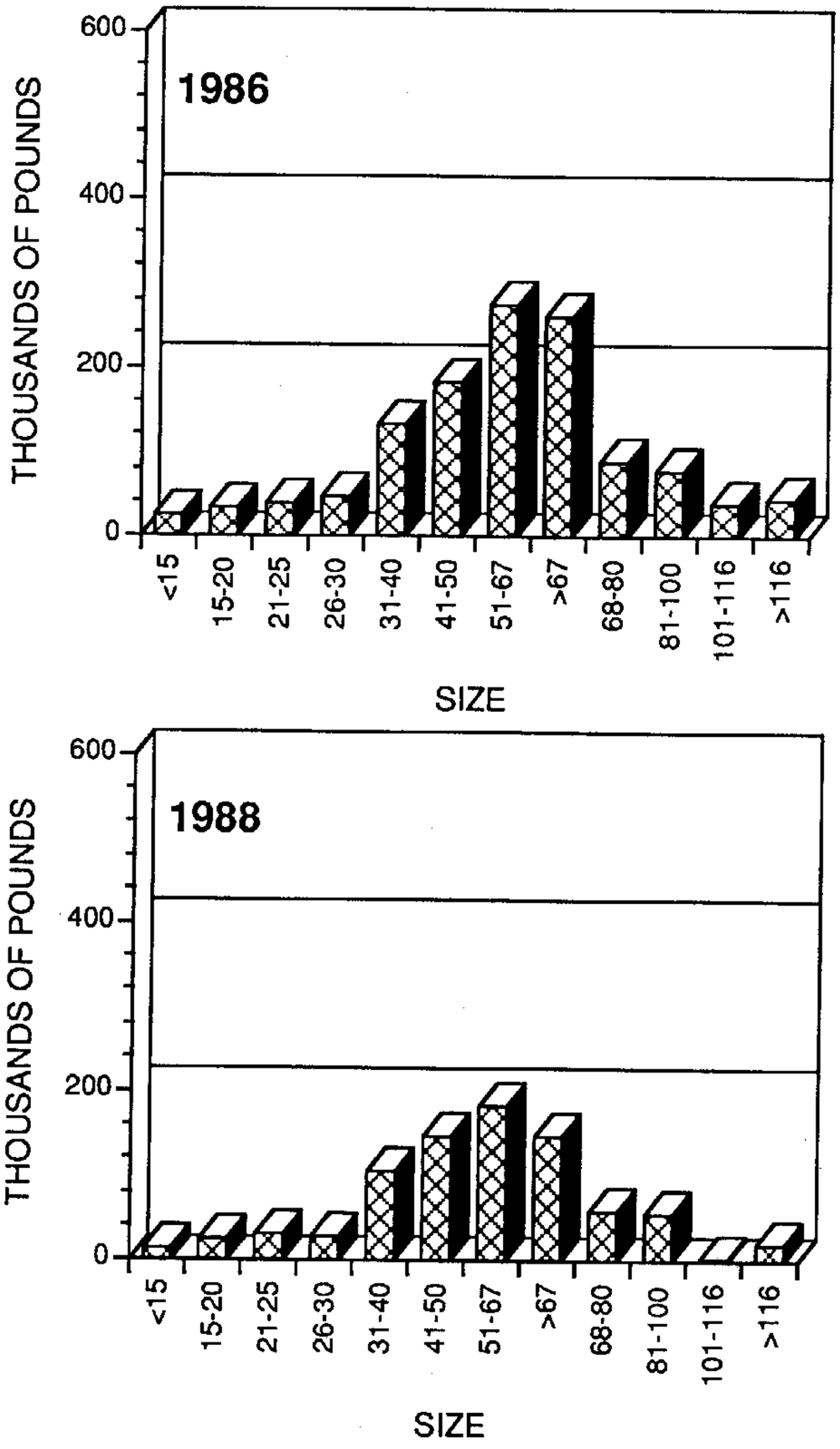
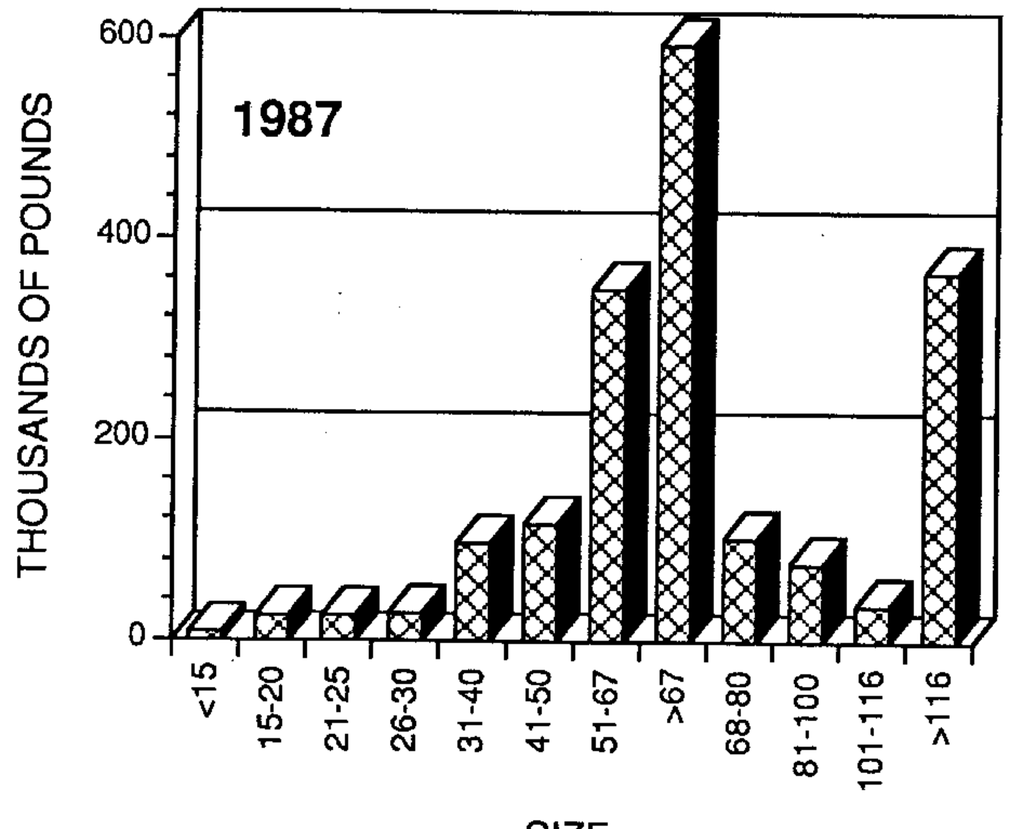


Figure 6a. June brown shrimp catch (thousands of pounds) inside15 miles, 1986-1989.





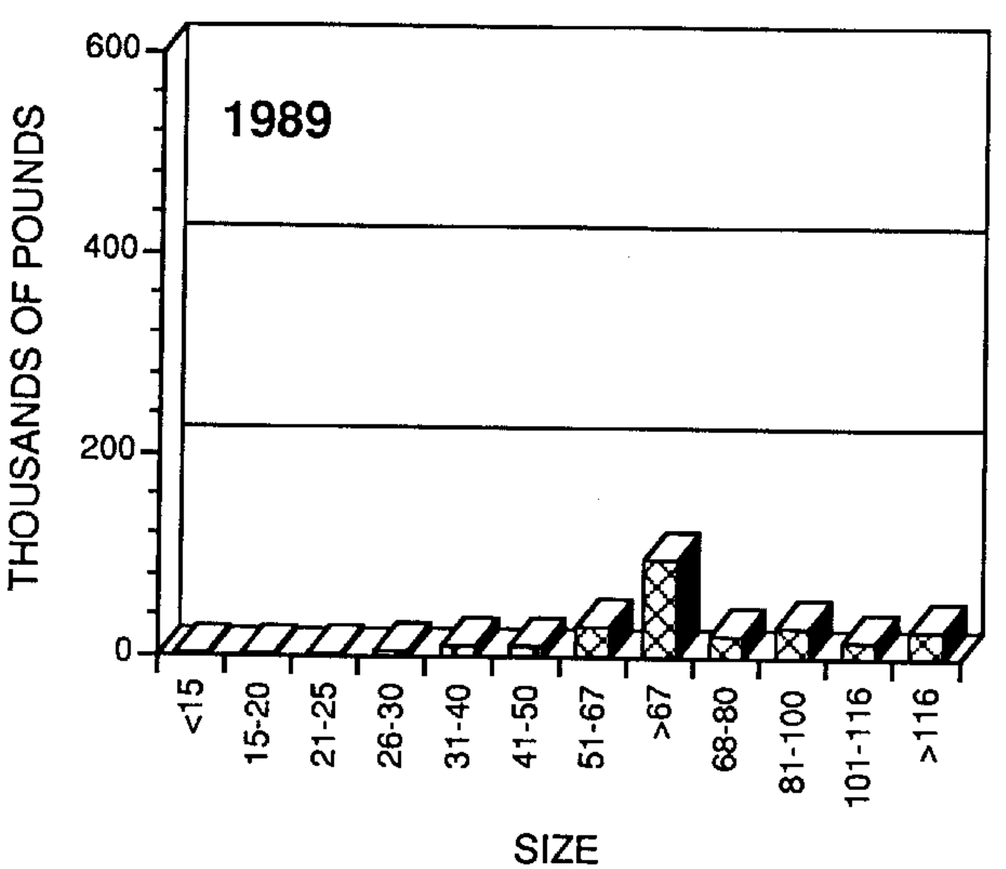


Figure 6b. Size distribution of June brown shrimp catch from offshore Texas waters, 1986-1989.

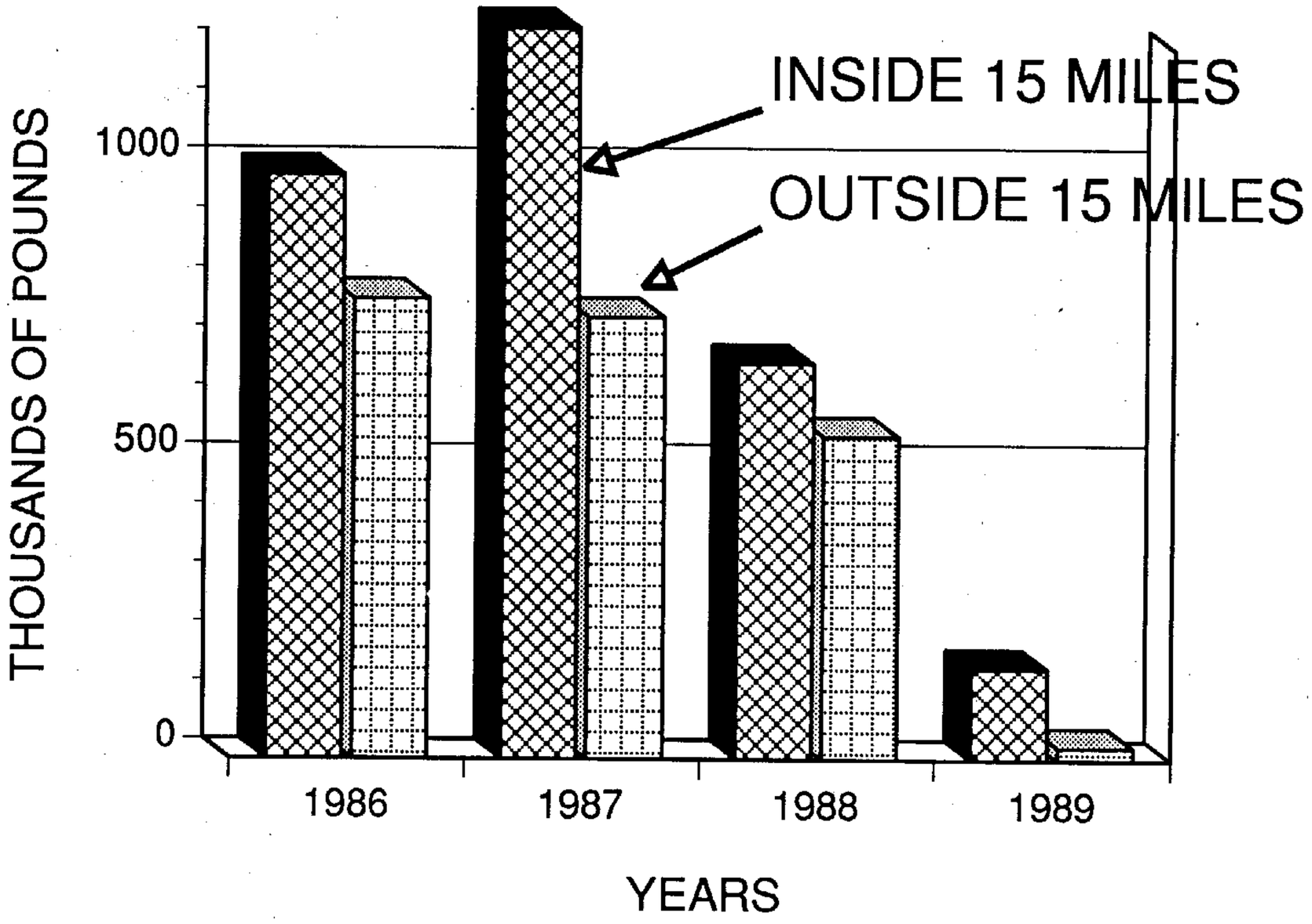


Figure 6c. June brown shrimp catch (thousands of pounds) inside 15 miles and outside 15 miles, 1986-1989.

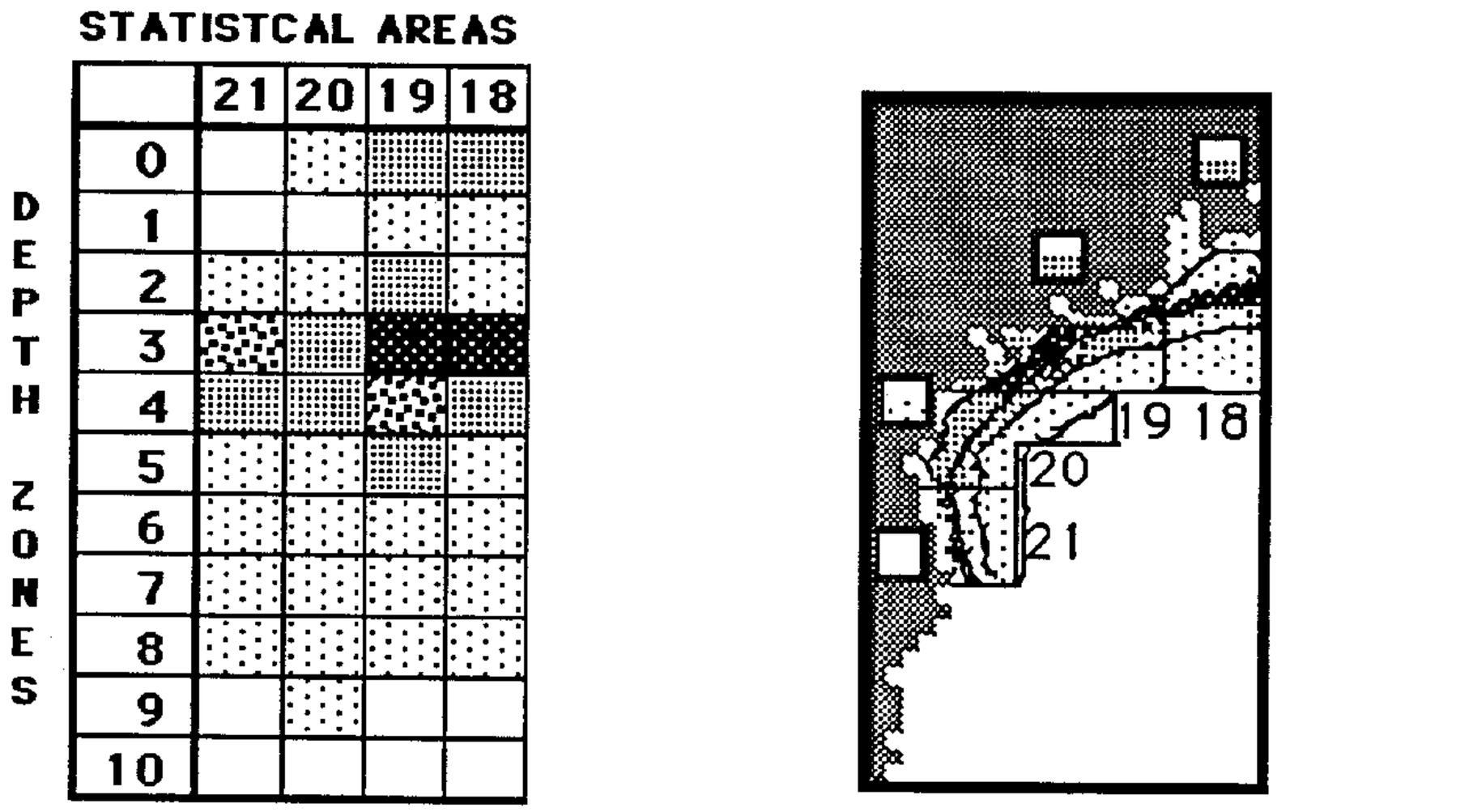
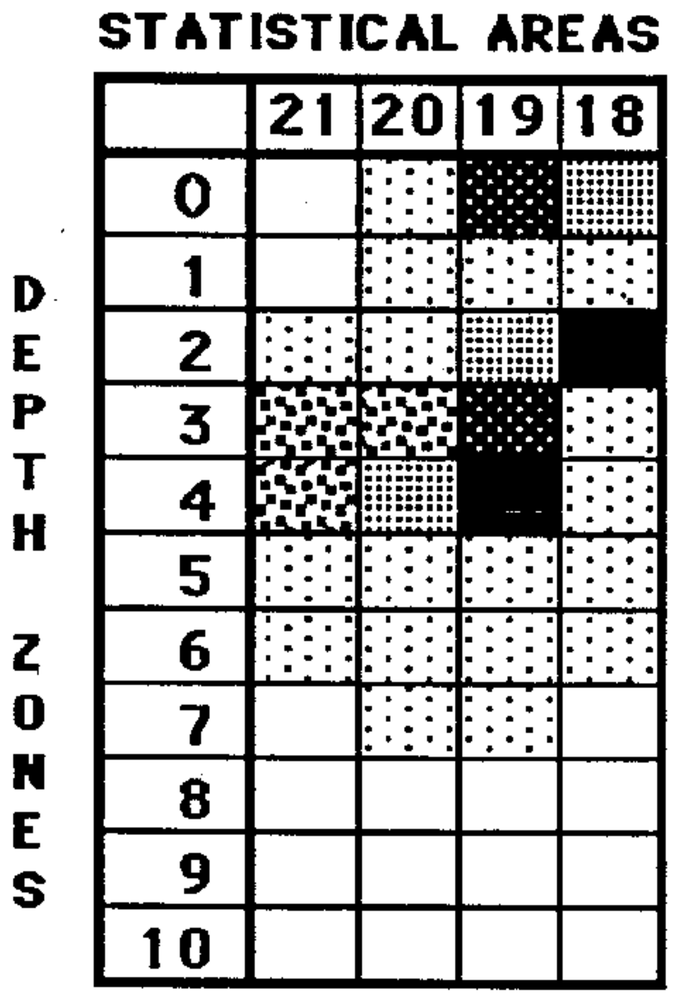
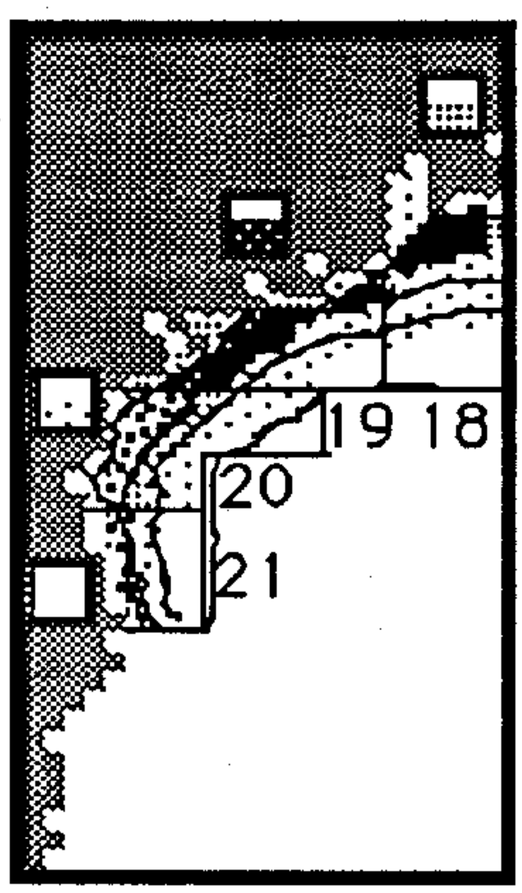


Figure 7a. Brown shrimp catch by statistical areas and depth zones for Texas during the1986 reopen period.





LEGEND: Multiply intervals by 10,000 pounds for actual values.

0.0 to 19.0

19.0 to 38.0

≥ 76.0

38.0 to 57.0

57.0 to 76.0

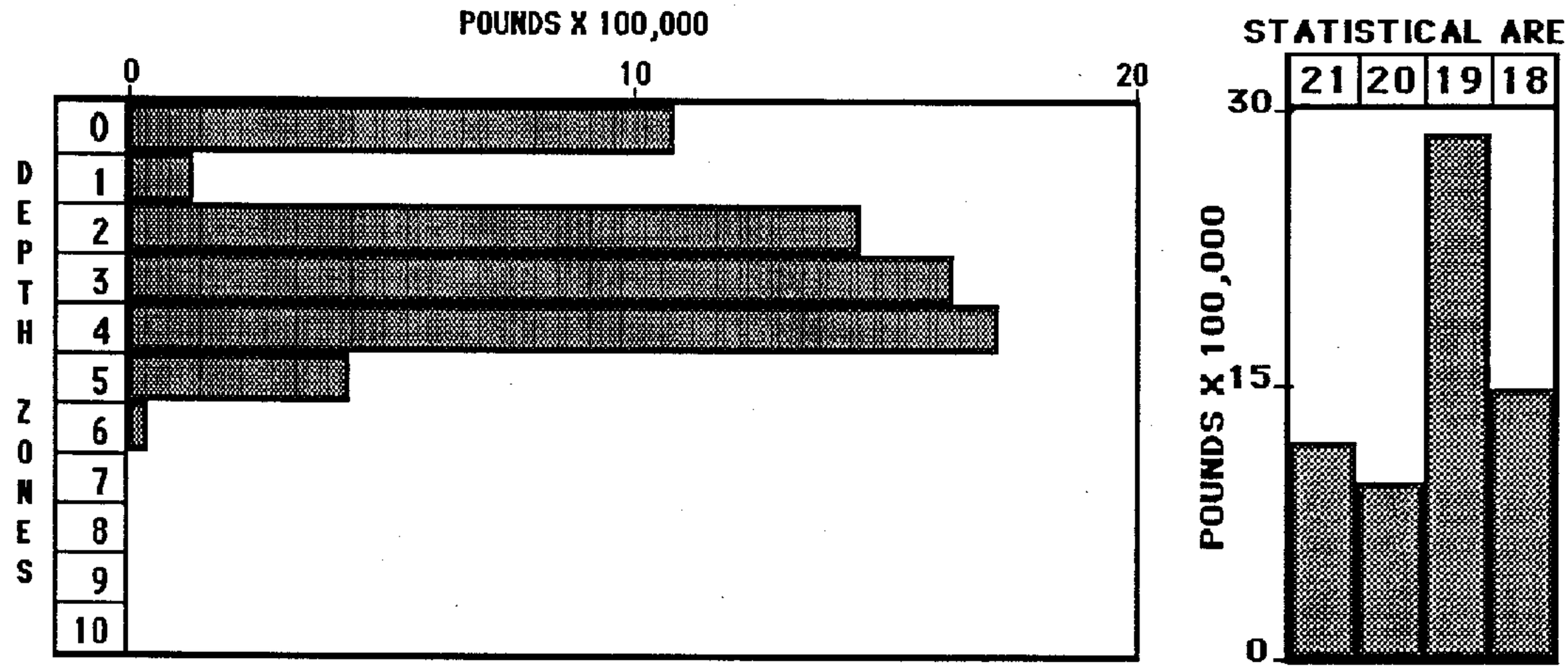
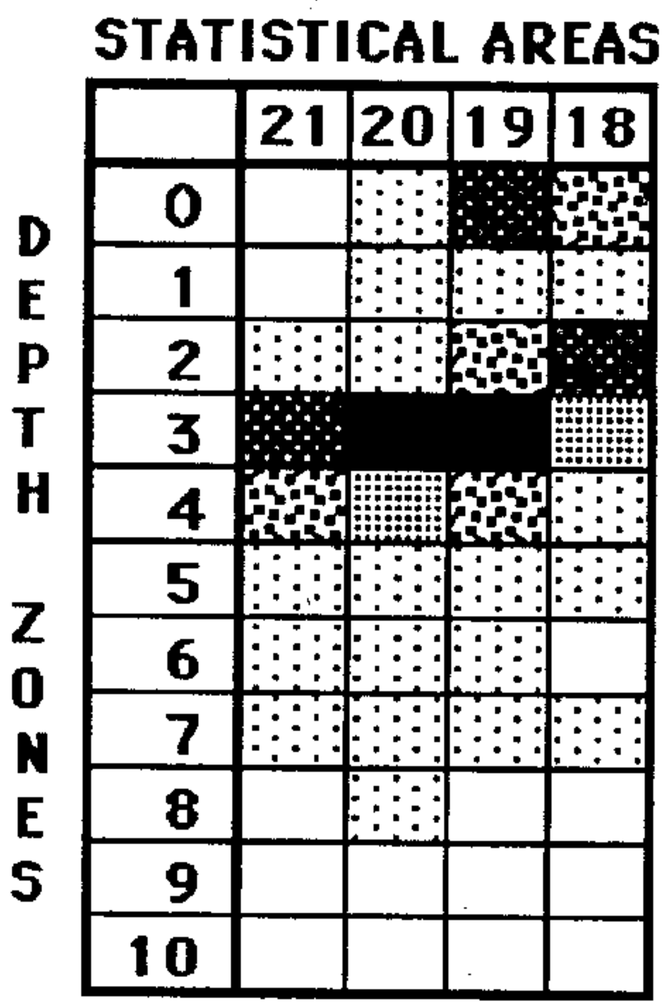
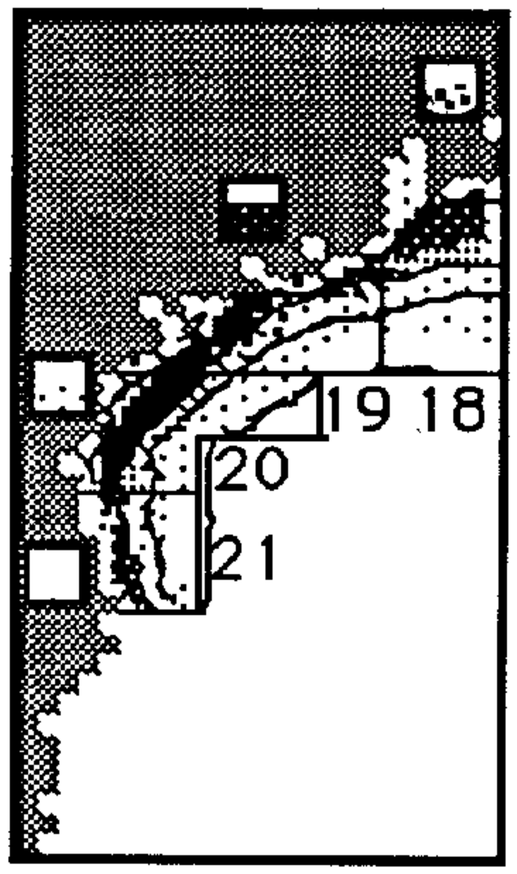


Figure 7b. Brown shrimp catch by statistical areas and depth zones for Texas during the 1987 reopen period.





LEGEND: Multiply intervals by 10,000 pounds for actual values.

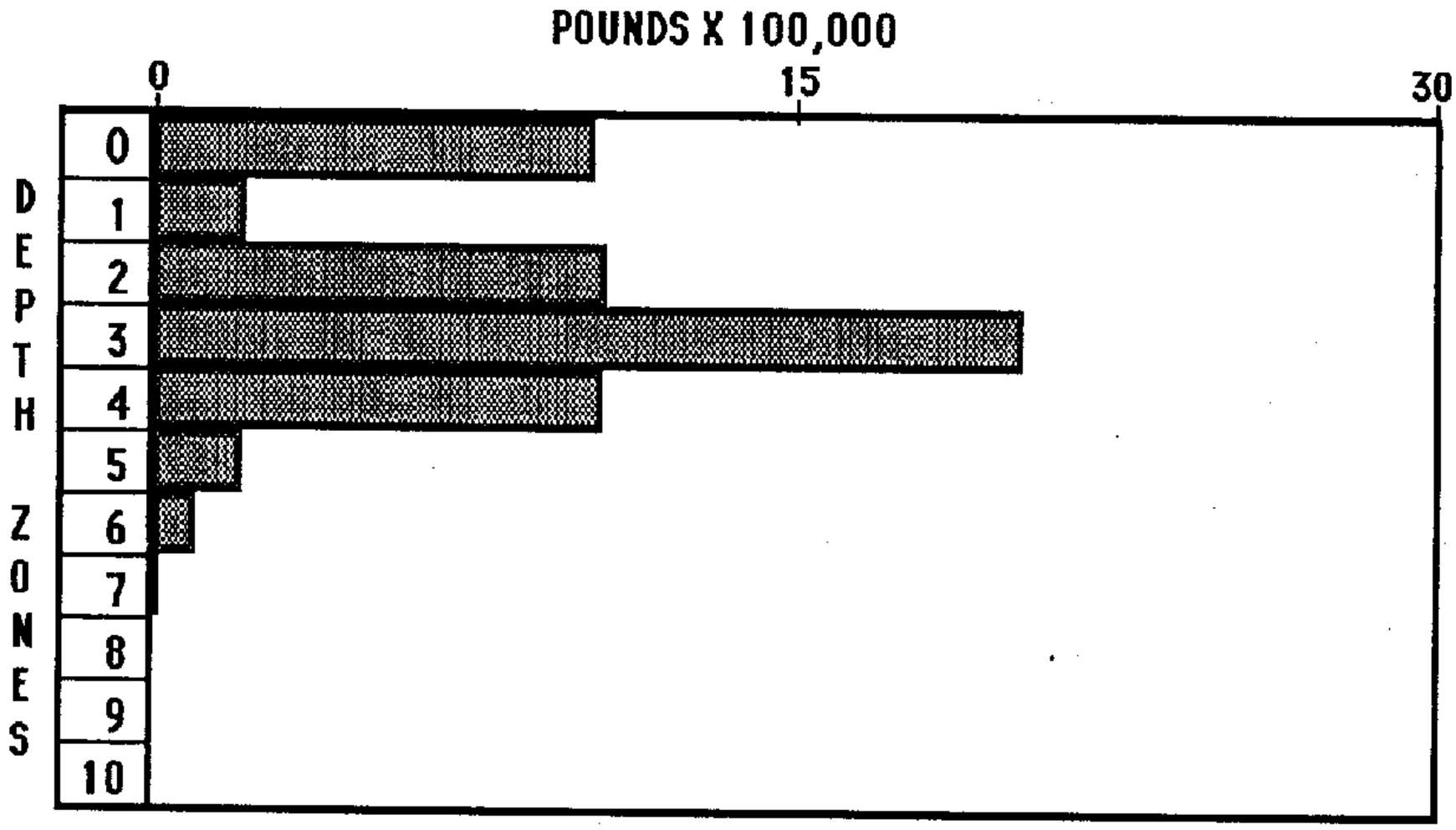
0.0 to 14.0

14.0 to 29.0

≥ 58.0

29.0 to 44.0

44.0 to 58.0



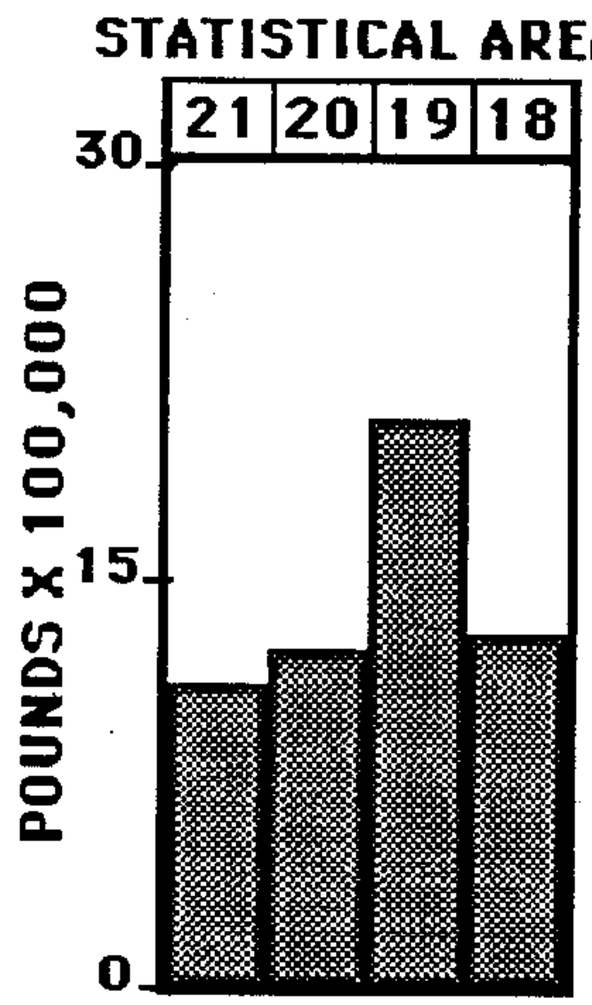


Figure 7c. Brown shrimp catch by statistical areas and depth zones for Texas during the 1988 reopen period.

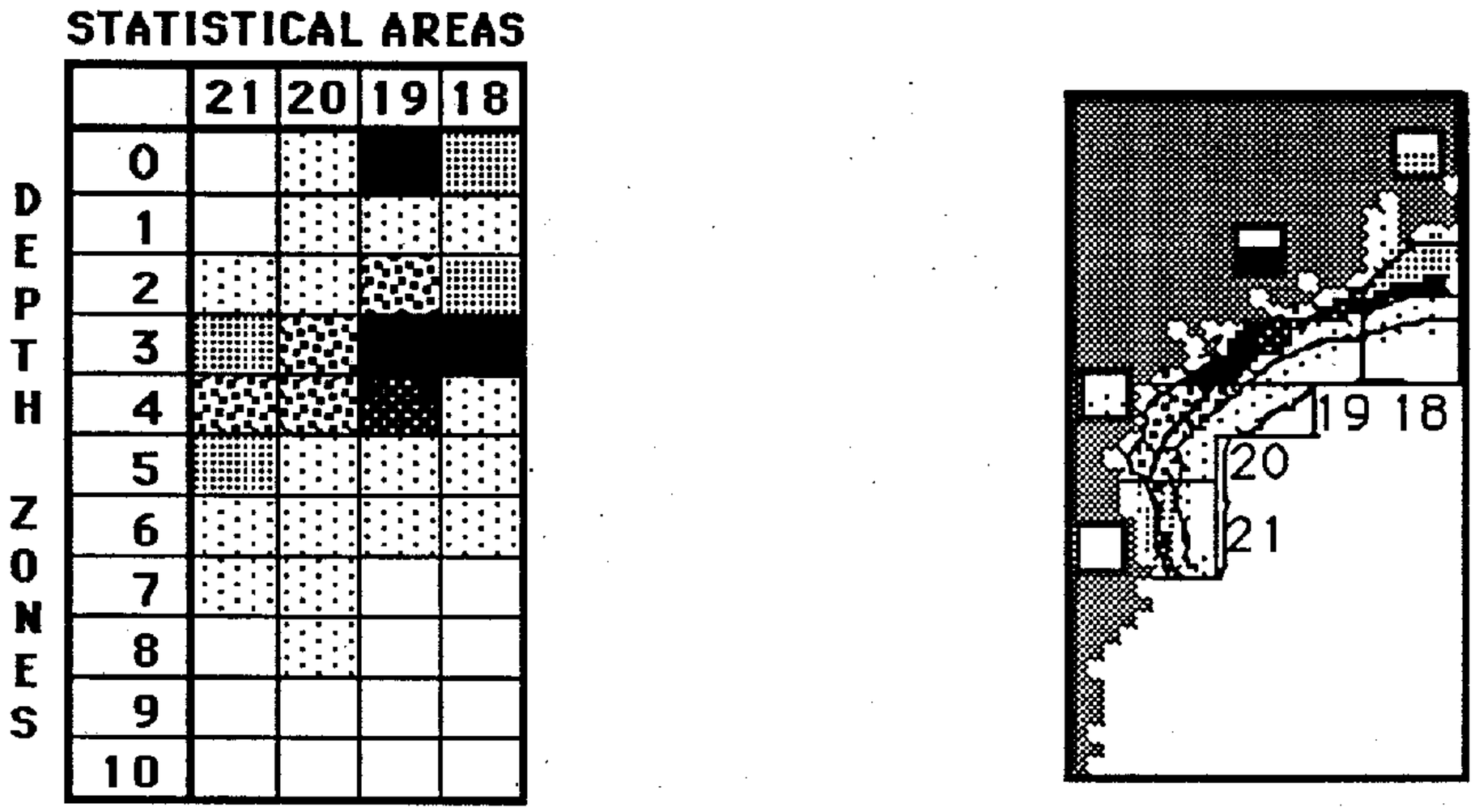
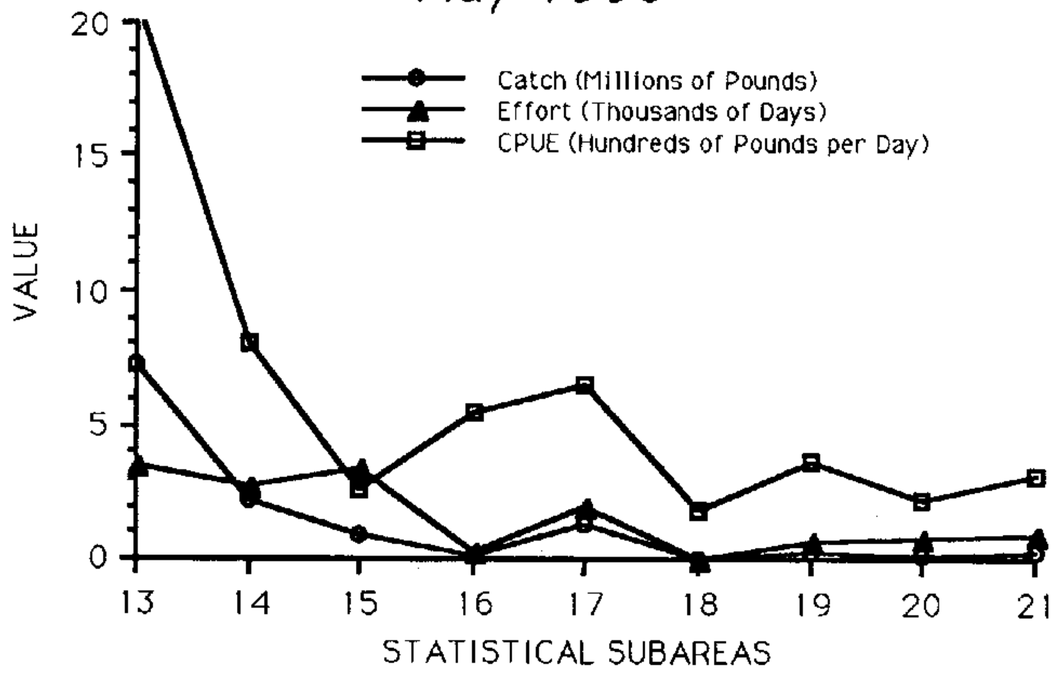
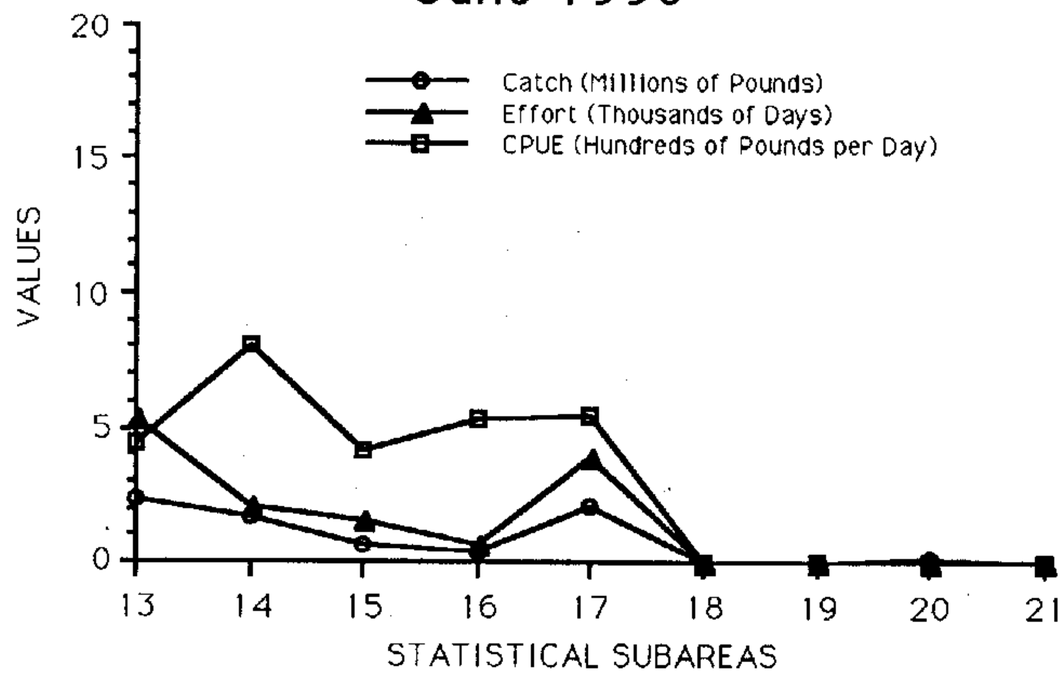
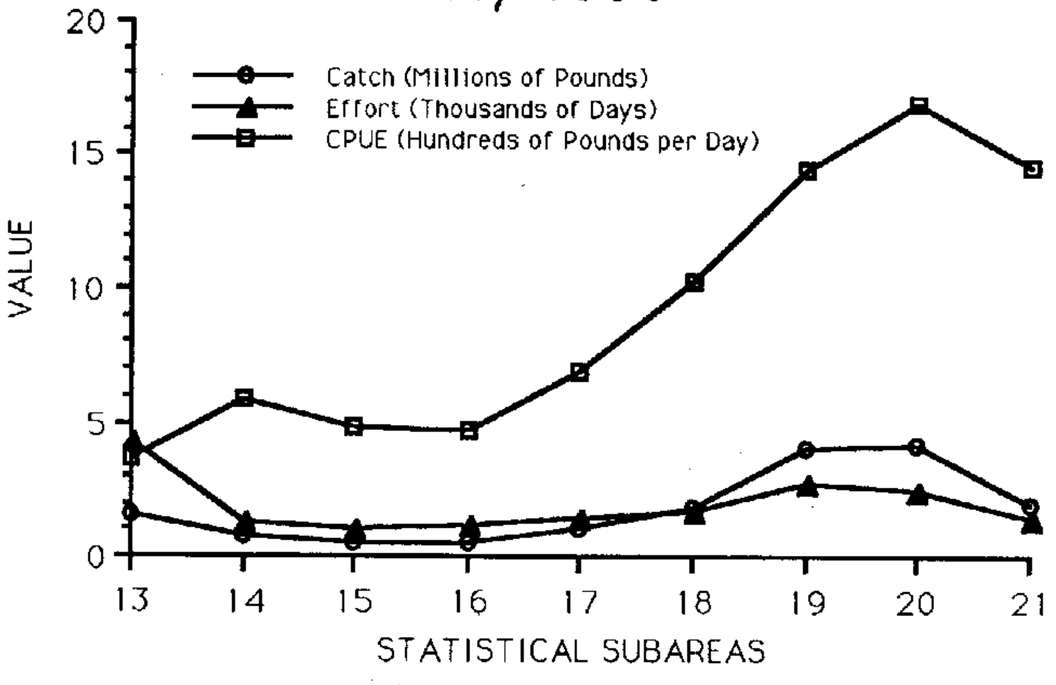


Figure 7d. Brown shrimp catch by statistical areas and depth zones for Texas during the 1989 reopen period.







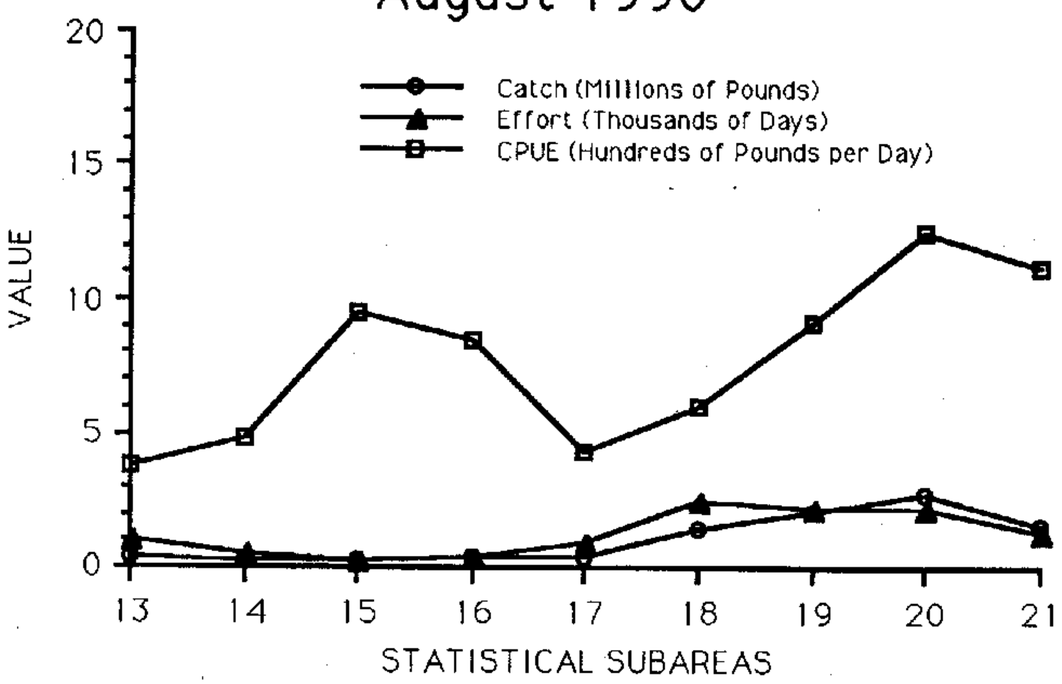
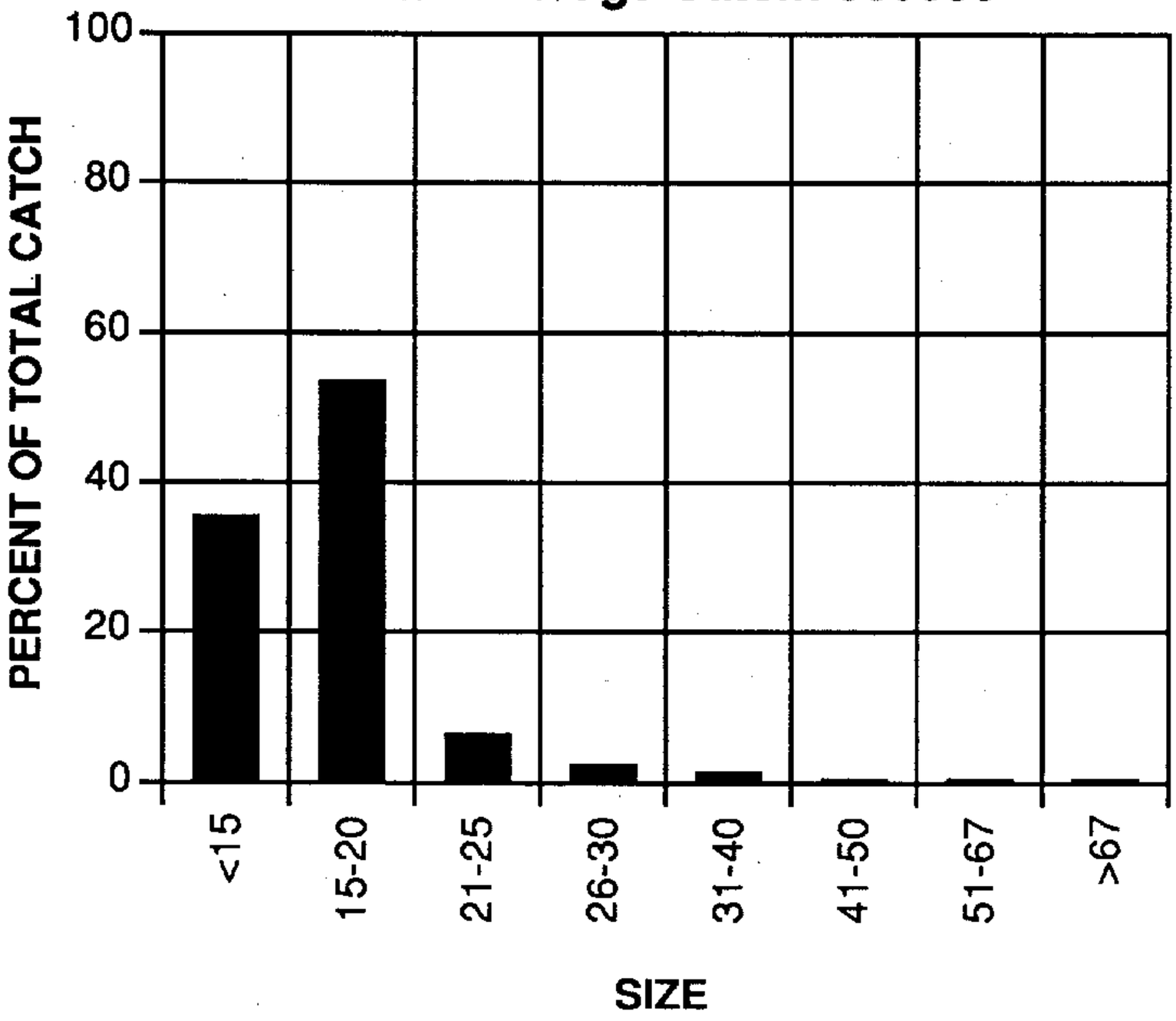


Figure 8. Offshore brown shrimp catch, fishing effort, and CPUE from statistical subareas 13-21 from May through August 1990.



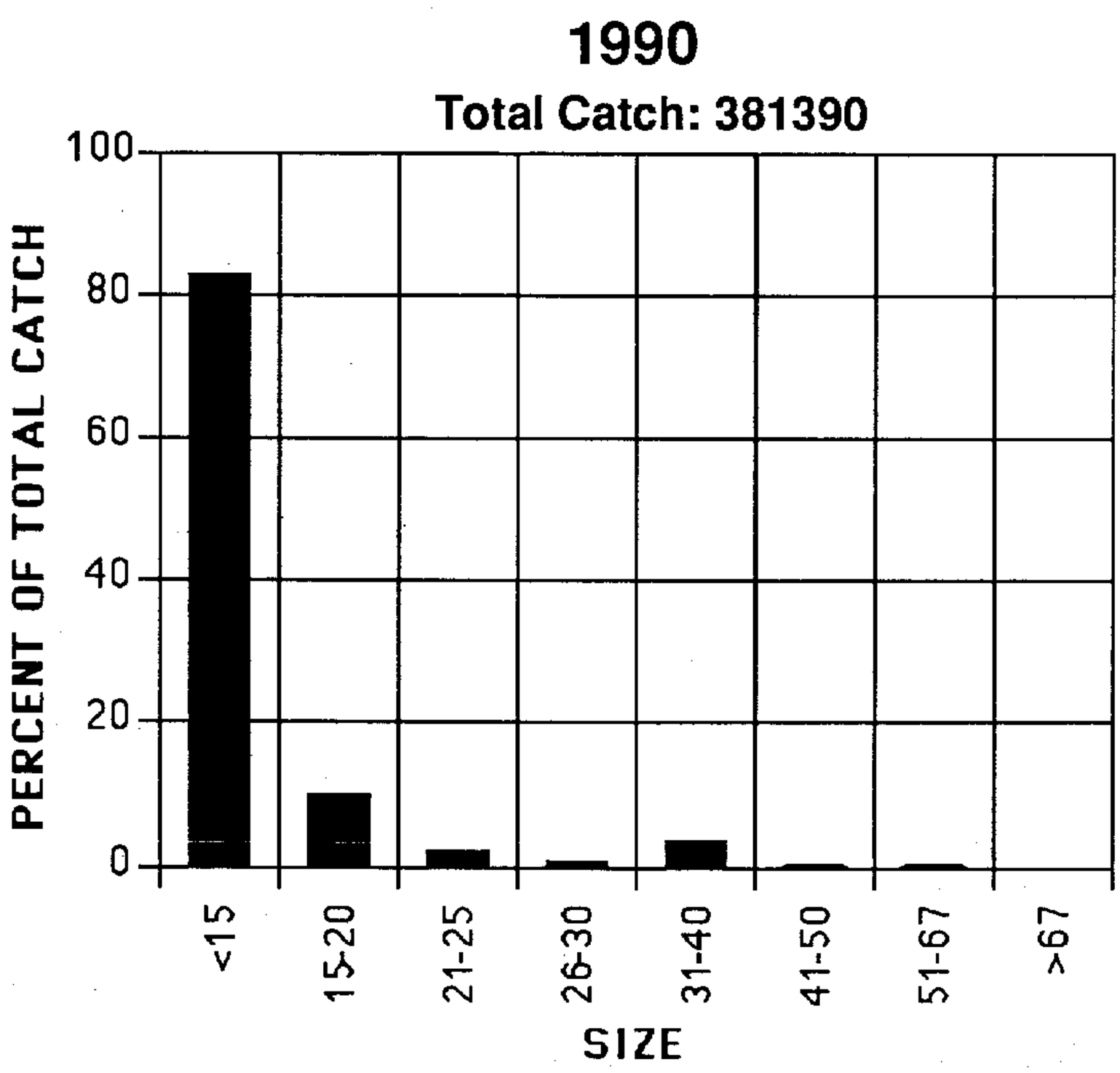


Figure 9. Percent of white shrimp catch for July from statistical areas 18-21, 1982 - 1989 and 1990.